CITY OF DETROIT

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A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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Twenty-ton Rope-driven Traveling Crane.

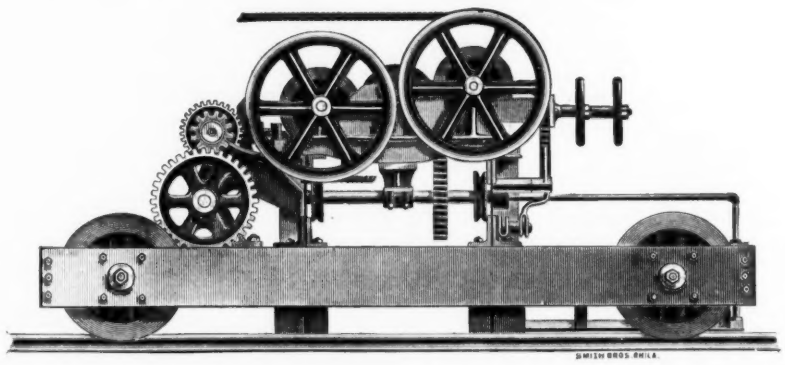
The accompanying cut represents a twenty-ton traveling crane built by Alfred Box & Co., Philadelphia, Pa.

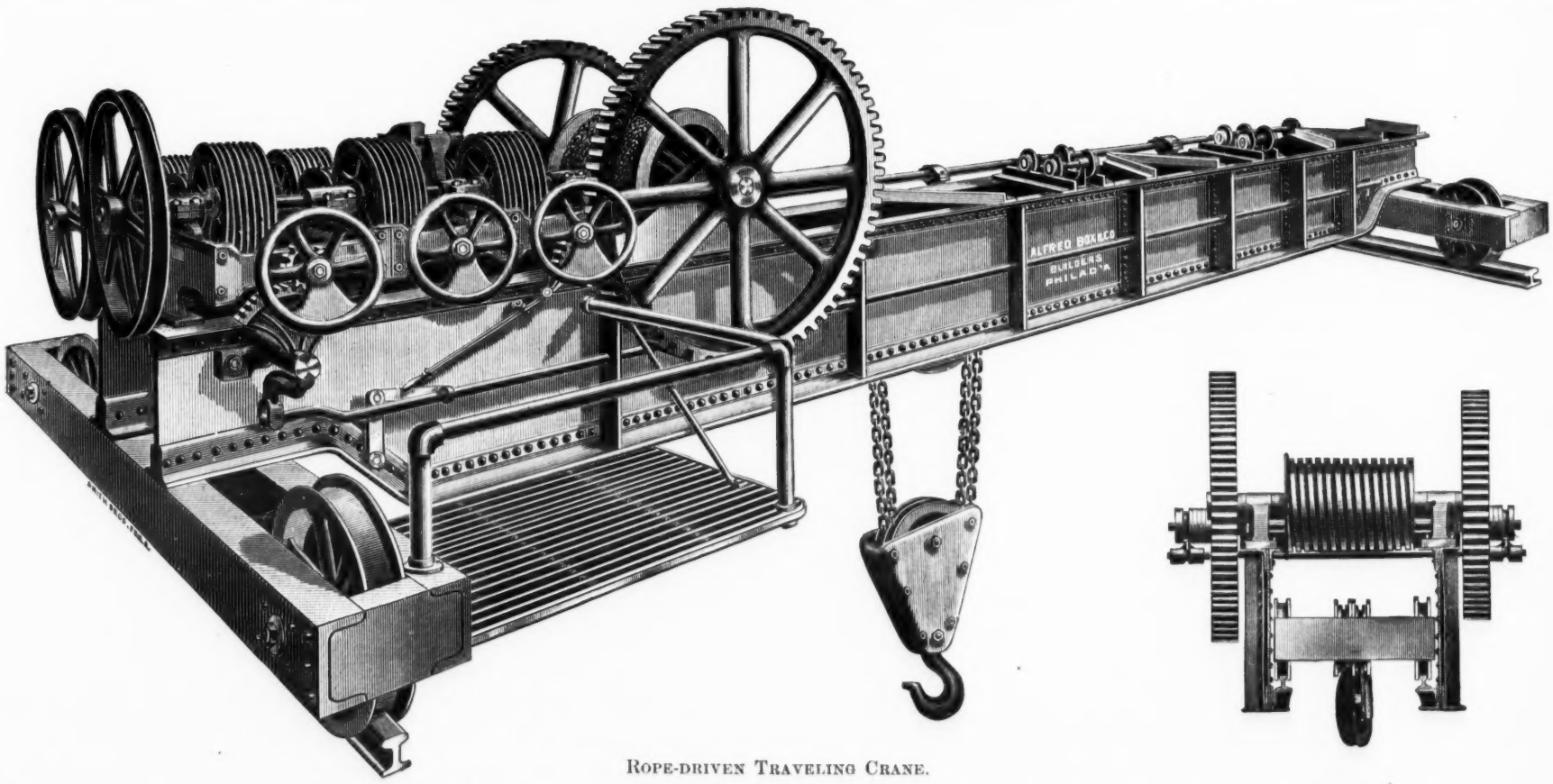
This style of crane has a number of peculiarities and radical departures from the older designs usually employed in cranes of this class. In the first place, it will be noticed the head gear is stationary and placed at one end, and in its frame are contained all the friction wheels and mechanism to operate the movements of the crane. This is entirely inclosed in sheet-iron case (not shown in cut), and yet is easily accessible by doors on top; this practically excludes the dirt from the vital parts, while the other journals are provided with well-covered bearings and roller bushings.

Power is conveyed to the grooved sheaves by $1\frac{1}{4}''$ rope, which is crossed and encircles the wheels about two-thirds of their circumference, these in turn driving two shafts; keyed on each are three grooved friction wheels. These shafts revolve in opposite directions, and between and slightly below them are three similar grooved friction wheels which are mounted in a sliding frame, operated by screw and hand-wheel; by this means the center wheel is drawn or forced into either of its companion wheels, thus causing any motion of the crane to be reversed or stopped at the will of the operator, and the whole operation is handled by simply turning either of the three hand-wheels to the right or left, thus avoiding a large number of complicated levers. The center frictions are geared to cross-shafts leading to drum, bridge and racking motions. It will further be seen that the drum is placed above the bridge, permitting the trolley to pass under, thus giving it full sweep from end to end of bridge.

The trolley is also provided with automatic stop motion to prevent running it beyond its limit.

The bridge is designed to give ample strength and allow plenty of room for large trolley wheels, and each girder is well secured together by diagonal bracing, making the whole structure very rigid and capable of standing severe strains and rapid motion. A dropped platform is provided when desirable, and the hand-wheels are placed below the bridge and geared to the upper screw shaft. The hook has a ball gearing and swivels easily with the heaviest load. All sheaves have roller bushings and work well without oil, which is important in foundry work, where excessive heat and dirt clog and dry up oil. The manufacturers have given special study to produce cranes that will meet all requirements for this class of work, and we are informed have met with good success in this line.





ROPE-DRIVEN TRAVELING CRANE.

Young men who have an idea of pursuing a course of study in some one of the excellent schools of mechanical engineering in the country should write for a catalogue. We are led to make this remark from a consideration of the amount of knowledge these catalogues furnish.

Proceedings of the Mechanical Section of the American Association for the Advancement of Science—Rochester Meeting.

EXHIBITION AND DESCRIPTION OF COMBINED YARD AND METER STANDARD BAR.

BY WM. A. ROGERS, WATERVILLE, ME.

The bar exhibited is of Jessup steel, one face of which is brought to a true surface with the points of support placed at certain distances from the ends. The graduations are marked directly on the finished surface, which is protected from corrosion by means of a thin coating of vaseline. To obtain a true surface the bar was first planed, and then tested with a surface plate. The high portions were either scraped down or reduced by means of a small lead lap. After this was done, a wax lap, which was first made true by testing with a surface plate, and scraping down the high places, was employed to finish up the surfaces. On the surface of the wax lap grooves were cut crossing each other, so that the surface is divided into small rhomboids, it having been found that this was necessary in order to produce a uniform effect along the bar. The grinding substances used were several grades of washed emery, washed savorine, and finally rouge. The bar is graduated directly from a standard bar, the errors of which are known, so that corrections may be made in marking the new bar. To show the extreme delicacy required in such work, Prof. Rogers stated that a correction had to be applied, to allow for the influence of the heat radiated from the body of the operator on the nearest bar. This correction is determined by previous experiments, and is, in a measure, proportional to the time of exposure. In graduating the bar exhibited, a slight error was involved in some of the graduations, because before making them the operator had taken exercise which caused him to perspire freely, so that, instead of the bar nearest the body becoming heated, it had been slightly cooled by evaporation, and the corrections were thus thrown in the reverse direction. A table of corrections accompanies the bar, giving in each case the number of parts in one million of the entire length of the bar that the graduations are in error. 776 of the 1,000 mm. divisions have an error not exceeding one twenty-five-thousandths of an inch. This degree of accuracy has only been attained by successive approximations. The standard yard was originally compared with the imperial yard of Great Britain, and the meter with the *Meter de Archives* of Paris. The error of total length of both yard and meter is known to within one, or, at the most, two twenty-five-thousandths of an inch.

To determine the error of the subdivision of the scale, the method of stops is employed. This consists in placing two stops so that the sliding table of the dividing engine, which carries a microscope containing a cross-bar, travels approximately a certain number of divisions of the scale in being

moved from one stop to the other The number of divisions selected must be an exact divisor of the total number into which the scale is divided. The scale is tested by adjusting the cross-hair of the microscope directly over one of the divisions, while the sliding table is against one of the stops, after which the table is moved until the second stop is reached. If the stops are set precisely in the correct position, and the scale is without error, the cross-hair of the microscope would fall directly over the mark on the scale, but, ordinarily, the cross-hair will not fall over the line, and the amount of deviation is measured by a micrometer. Each succeeding portion of the scale is gone over in this way. After the entire scale is gone over, the sum of the micrometer readings is taken, and that portion of the error due to setting the stops eliminated by subtracting the mean value of the corrections from each. This gives the relative error of each successive subdivision; to obtain the accumulated or total error reckoned from the initial point we sum the series.

In the case of the meter scale, the error of the middle graduation was first determined, and the errors for the decimeters worked over until the error for the middle division came the same by the two methods.

The discussion of this paper was mainly in regard to the difficulty of obtaining a perfectly true surface.

Mr. J. A. Brashear stated that in special cases he had spent several weeks in making a plane surface for optical purposes two inches square. Several other members present gave their views in regard to the proper methods of grinding to a true surface.

Prof. Rogers replied that he did not strive to obtain a mathematical true surface in his bars; his test was to move a microscope, used in testing the graduations and having a high magnifying power, along the face of the bar; if this remained in focus, he considered the surface accurate enough for his purpose.

ON THE USE OF LONG STEEL TAPES IN MEASURING BASE LINE. REPORT OF U. S. C. AND G. SURVEY.

By R. S. Woodward, Washington, D. C.

A method of standardizing steel tapes by means of an iced bar comparator was first described, after which numerous experiments were presented that showed the error involved in using such tapes in measuring a base line one kilometer long. The iced bar employed in the comparator consists of a bar of steel, on which are lines five meters apart, at a temperature of 32 degrees Fahr. To preserve the bar at this temperature it is surrounded by ice. The whole is mounted on a carriage that travels on a small railway. In measuring off the length of the comparator, which in most cases was 100 meters, the cross-hairs of two microscopes were first made to coincide with the lines on the bar. The bar was then moved forward, and the mark on the end nearest the starting point placed under one of the set microscopes. A third microscope was then set over the end away from the starting point. The microscopes were mounted on wooden posts. At the ends of the comparator two stones are solidly imbedded in the earth. In each of these stones a rounded brass projection is imbedded, to mark the ends of the comparator. To place the microscopes directly over these end points a special device containing a level is used. Having obtained the proper setting of two microscopes that are the length of the comparator apart, the tape is held under them in a way that was found to be the most convenient and reliable in field work. Stakes are set ten meters apart along the line to be measured, and in the side of these round steel wire nails are driven. The tape is supported on these nails. The corrections necessary to apply, if the posts are set at a greater distance, as in crossing a stream, can be easily computed from data furnished by preliminary experiments. The tension of the tape was made the same, about 25 pounds in all measurements, by means of a spring balance at one of its ends, a breaking piece being inserted, so that by no means could the operators overstrain the tape. Temperature observations were made in each case, three special thermometers being used with blackened bulbs, so that the surface had approximately the same radiating power as the tape.

It was proved by the comparator that, with ordinarily careful handling, there was no variation in the length of the 100 meter tapes after long use. To test the efficiency of the steel tapes when used in the field, a kilometer was measured by means of the iced bar, and this kilometer used as a standard. It was found that the probable error of a single measurement of this kilometer by means of the steel tapes was about one part in 500,000, and that the probable error of the average of a number of observations was about one part in 1,500,000. So that the general conclusion arrived at is, that for measuring base lines, steel tapes, as standardized by the iced bar comparator, will give ample accuracy. The time required to make duplicate measures of the kilometer with the tapes is about one hour, and in special cases it was measured in one direction in twenty minutes. The method of measuring the standard kilometer by means of the iced bar apparatus, and probable error of the total length, was given in another section of the society, but as it is of interest in connection with the present paper, the following table is here given, which compares the probable errors involved, with the results obtained by previous workers in the same line:

Probable Error in Measuring a Kilometer.

Best work of Lake Survey.....	±0.40 mm.
Recent work of French on Paris and Perpignan base.....	±0.67 mm.
Best work of iced bar:	
1st. On comparator.....	±0.10 mm.
2d. On kilometer.....	±0.12 mm.

This table shows that the error in the work done with the iced bar is about one-quarter that of any other method previously adopted.

The greatest source of error was found to be the difficulty of determining the temperature of the tape correctly. It is generally supposed that a cloudy day is preferable for measuring with steel tapes, but the experiments indicated that such was not the case. The best time was found to be in the evening, while dew was being deposited.

Prof. Rogers stated that he agreed with Mr. Woodward that the temperature element was the greatest source of error in measurements of length. In his opinion the exact results obtained with the tapes was due to the fact that they were of a small mass, and partook readily of the same temperature as the air.

Prof. S. W. Robinson gave a description of the method employed in measuring a base-line in the ordinary way. A clearing is prepared and graded as carefully as a railway bed, and the apparatus employed is very bulky. He also mentioned another methed that he had employed some years ago, of measuring with a steel piano wire having circular pieces fastened on it at the measuring points. Around the circular pieces V-shaped grooves were cut. In using the wire the circular pieces were held against ordinary surveying pins. If the operator happened to pull too hard on the wire while it was being held against the pin, the form of the groove was such that the circular piece would slip by the pin without tending to displace it. This method was recommended only where moderate accuracy is required.

RESULTS OF MUNICIPAL OWNERSHIP OF GAS WORKS IN THE UNITED STATES DURING 1891.

By Edward W. Bemis, Chicago, Ill.

The results of data collected, either directly from the reports of the several companies, or given by them in an indirect way and reduced by Mr. Bemis, are given in the following table:

Prof. Bemis stated that it would be well for all cities to own their gas plants instead of allowing the profits to be absorbed by private corporations, and that if it were not for the fact that corporations of this kind influence the press, the fact that city ownership would be the most profitable might have been brought out long ago. It was also argued that local politics would not affect the practical working of a plant owned by a city, and to illustrate this the terms of office of the several superintendents and managers of the companies mentioned in the table were given, and it was noticeable that changes in the management were not often made. The main misleading feature in estimating the profits of gas corporations is, in the opinion of Professor Bemis, that the private gas companies over-capitalized their stock, so that the per cent. of their earnings appear rational, whereas it is in reality excessive. To illustrate this, column 5 of the above table is given, which is the cost to replace the entire plant. Professor D. S. Jacobus called attention to several points in the reasoning entered into by Professor Bemis; in the first place, column 4 of this table where the price is given per thousand feet of gas is misleading. This is obtained by including all the repairs and extensions for the year 1891, but no estimate is made to show that the amount so expended will be the yearly rate to cover depreciation over a long period of time. The statement was made that all the plants were in better condition at the end of the year than at the beginning, which may have been so in regard to minor details, and not so for the more lasting portions of the plant, such as the holders, main piping, etc. Again it is not fair to assume that the cost to replace a plant represents the capital invested. The capital that a company must advance in starting an enterprise is that to develop it from its first conception, which is greatly in excess of the figures used by Prof. Bemis. Furthermore, the rates charged for gas in Philadelphia are higher than in New York, where the city is supplied by private companies, and it is claimed that there is less cause for complaint in the latter city on account of the quality of the gas.

Gas Data, By Dr E. W. Bemis, 1891-92.

City.	Began city ownership.	Cost of coal [2,240 lbs.]	Coke per bushel.	Net cost in burner per 1,000, no interest or taxes.*	Cost of duplicating entire plant per 1,000 in burner.	Per cent. of leakage.
Philadelphia, Pa...	1841	$4.10	5.5c.	$0 862	3.60	14.7
Richmond, Va.....	1852	4.60	6 0	0.843	3.30	16.0
Alexandria, Va.....	1853	3.82	6.25	0.943	4 18	12.4
Henderson, Ky.....	1867	2.61	8.6	0.581	4.62	12.0
Wheeling, W. Va..	1870	1.64	3.5	0.353	2.91	10.25
Bellefontaine, O...	1873	3 34	8.5	0.637	4.40	6.4
Danville, Va.....	1876	4.39	10 0	1.077	4.67	19 0
Charlottesville, Va.	1876	3 75	10.0	0.743	5.54	24.6
Hamilton, O... ...	1890	2.60	——	0.620	——	——
Fredericksburg, Va.	1891	4.25	8.0	1.271	8.00	18.0

*No depreciation taken, as all repairs and extensions are included.

DESCRIPTION OF A TRANSMISSION DYNAMOMETER [MODEL EXHIBITED].

By G. W. Hough, Evanston, Ill.

This dynamometer is designed for use in testing dynamos and motors. It consists of a pulley mounted on a sleeve so arranged that it can be attached to the dynamo shaft in place of the regular driving pulley. The driving force brought to bear on the pulley is resisted by a spiral spring, one end of which is fastened to the sleeve and the other to the inside of the pulley rim. Ball bearings are employed between the pulley and the sleeve. The amount that the pulley is twisted around the sleeve, which measures the amount of driving force, is indicated by a sliding piece that fits over a projection on the end of the sleeve. This sliding piece is moved in proportion to the amount that the pulley rotates by means of a helical groove in the projection that carries it. All slack motion of the sliding piece is taken up by means of a spring placed so as to force it outward.

The dynamometer exhibited was designed to measure four horse-power as a maximum, and had been used up to this limit. It was found to give readings with as great a degree of accuracy as could be obtained in the electrical measurements when made in the ordinary way, and has given great satisfaction. Experiments were made with a view of standardizing the dynamometer by means of a Prony brake, but the brake readings were not steady enough to give reliable results. An advantage in using this dynamometer is that the roller bearings have so far reduced the friction that it can be readily standardized by attaching weights to a band passing over the rim of the wheel.

Mr. Wm. Kent asked why the Prony brake test was abandoned, as such a comparison is a crucial test for the accuracy of a dynamometer. If there was a disagreement he would consider it the fault of the dynamometer, and not of the brake. If this had not been done, how was the error due to friction determined?

Prof. Hough replied that the fact that the Prony brake could not be made to run uniformly was the only objection to its use. In regard to the friction he considered that this was practically eliminated by the roller bearings. It was found impossible to standardize the dynamometer accurately by hanging weights on it before the roller bearings were introduced.

Prof. Jacobus stated that, if the Prony brake were properly made, there should be no trouble in obtaining steady readings. In a special form of brake employed in tests at the Stevens Institute, the weight could be read to one-twentieth of a pound, and the lever arm measured to one-hundredth of an inch. To obtain this degree of accuracy the lever arm was attached to a frame that passed on each side of the brake pulley, and was held in place by two bearings passing over the shaft. The friction was produced by a rope on the brake wheel, which had a hollow rim in which water was held by centrifugal force. The water evaporated gradually, and prevented overheating. The friction in the class of a dynamometer exhibited by Prof. Hough would not, as a rule, affect its readings. The index of a rotary dynamometer when running, will, as a rule, move from one side to the other of its true position; this causes the friction to act in both directions, so that it is neutralized. Furthermore, the jar and the movements of the parts tend to make the actual friction much less when running than when at rest.

Launch of the Cunard Twin-screw Steamer "Campania."

In regard to the launch of the steamer "Campania," the London *Engineer* of September 29th says:

Yesterday was performed at Fairfield Yard, on the Clyde, a feat the equal of which in its way has not been attempted since the "Great Eastern" was put into the Thames at Millwall, thirty-five years ago. The Cunard steamer "Campania"—the first of the two intended Atlantic record breakers—was launched shortly before 2 P. M. into the sewer or unsavory canal upon which has been brought the wealth of the city of Glasgow. Brunel launched his monster ship sideways because of her great length, and was we forget how many days in completing his task; but the builders of the "Campania" have launched their 600 feet of steel structure stern foremost into a river which, measured in the direction of the launching ways, is only 900 feet across. Mr. R. Saxon White, the manager of Fairfield Yard, is to be congratulated upon the courage, foresight, and skill which he has displayed, and in the success which he has achieved.

Looking from the deck of the "Campania," shortly before she was released, it appeared an impossibility to slide 9,000 tons weight of steel structure, measuring 600 feet in length, into so narrow a stream without accident. And yet the feat has been accomplished. Moreover, nobody at Fairfield seems to have ever experienced a doubt upon the subject, so thoroughly was every detail thought out and planned from the first, and so carefully was every step in the work attended to as it progressed. The cradle and ground ways were commenced several weeks ago, and, indeed, were practically completed on the occasion of the recent visit of inspection of Lloyd's Registry Committee to the

Clyde. Only a pair of ground ways were used, the breadth of each being, however, sufficient to leave but a fairly moderate weight per square foot of area when the structure was wholly resting upon it. The difficulty to be coped with was, in fact, not so much a minimizing of frictional resistance to the vessel's motion as that of gently and gradually, yet surely, stopping her motion when once she became fairly afloat. Nevertheless, the sliding of 9,000 tons into the Clyde was in itself a task of no small magnitude, and, in view of the fine form of the fore body, great ingenuity and care was necessary in order properly to support her bow extremity in the launching cradle. Of course for a long distance forward the only way to do this was to make full use of the edge laps of the shell plating; and as, in spite of the heavy scantlings of the "Campania," these are necessarily very narrow, the poppets and other vertical supports needed careful fitting and efficient combination. By an ingenious arrangement of wedging, notching, and dovetailing, all this was very effectually accomplished, and there was no more interesting feature in the launching arrangements to the initiated observer than this device of Mr. White's for the purpose we have described. At the after end of the vessel—also very fine and clean—matters were rendered much simpler by reason of the peculiar form of the structure for housing and carrying the twin screw shafting on each side. The screw shafting in these vessels is wholly inclosed within the hull, thereby leaving nothing unsupported, and consequently providing against such deflection as contributed to disaster in the "City of Paris." The "wings" thus formed afforded excellent support to the long range of aftermost poppets extending to the propellers.

The launching ways were greased and "turned in" a week before the date fixed for putting the "Campania" into the water, the interval being fully occupied in replacing the previously prepared and fitted parts of the cradle. The river, too, had been carefully dredged during the same time, so as to form a hole of the requisite length, breadth, and depth for the vessel to float in and be turned into the fitting-out basin of the company. In this latter spot the wharf has been lengthened by extensive pilings, so as to accommodate a vessel of such huge dimensions below the sheer legs used in lifting the boilers and machinery into their places.

To check the "Campania," Mr. White employed eight heaps of chain cables—four on each side—the collective weight of the cables being between 500 and 600 tons. These were simply dragged by the vessel over the ground, their weight and frictional resistance affording the only means of stopping her when afloat. By using heaps of chain cables in this way, Mr. White availed himself of two forms of resistance. In the first place, when moved by the vessel the component parts of each heap of chains adjusted themselves until the whole body was in direct tension, and in this manner a gentle buffer-like force was brought to bear upon the checking cables, preparatory to the greater resistance offered by the drag of the whole body of chain upon soft or uneven ground. Two of the cables passed through the hawse pipes on each side, and other two were shackled to two substantial plates riveted on each side of the vessel at localities which were stiffened on the inside by the presence of bulkheads and longitudinal stringer girders. It will thus be seen that in attacking the problem of putting the "Campania" into the Clyde, the Fairfield Company took every precautionary measure which long experience in launching huge steamers could suggest, and the success of the operation confirms the wisdom of all that was done. The ceremony of naming the vessel was performed by Lady Burns, wife of Sir John Burns, Bart., of Wemyss Castle, and the subsequent proceedings were of a wholly informal character. The launch was witnessed by a large body of spectators, the yard gates being thrown open to the public, and platform accommodation being provided at the bow of the vessel for three hundred privileged friends of the company. There was no luncheon or speeches. The owners think it will be time to talk about the ship when she has done something of which to boast.

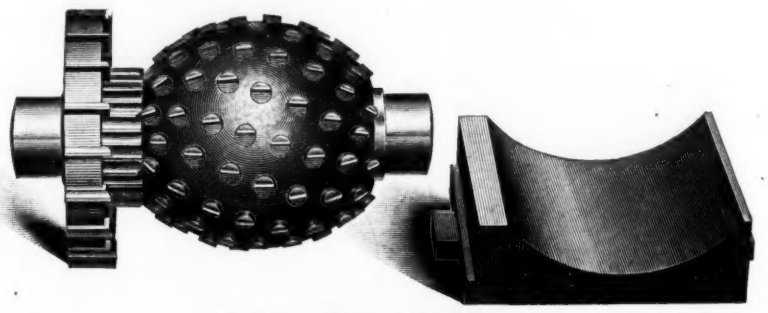
Several months of hard work remain to be performed before the "Campania" will be ready for her steam trials. Her engines, boilers, funnels, uptakes, and steam pipes are all ready to drop into their places; and the joiners' work is well advanced. Probably by the beginning of March she will be a completed vessel—a credit to her able builders, and, we trust, a source of profit to her enterprising owners. It is to be hoped—and indeed expected—that her speed will be such as to still further materially shorten the time distance between these islands and the United States. The sister vessel "Lucania" is being plated, and appears to be rather more than two months behind the vessel which was launched yesterday.

A Special Milling Cutter.

We present herewith an illustration of a gang of milling cutters made by the Ingersoll Milling Machine Co., of Rockford, Ill. These cutters were made for milling the guides of a Corliss engine, and a block which was milled in testing them was photographed with the cutters, and is shown by the engraving.

The radius of the circular portion of the cut is 4¼", and the cutter for this is 8" diameter. The other cutters are 8¼" and 4½" respectively. The surface produced by these cutters is accurately and smoothly finished and it is found that this method of forming the cutting edges of a number of small steel pins set into a cast center is well adapted to any desired form. Such cutters are, of course, adapted to use on any milling machine, and are used in a variety of forms on machines built by the company up to 36" wide, and 12" or more in diameter.

Some one has defined a crank as a man who knows a good deal on some subject upon which other people know nothing, or words to that effect.

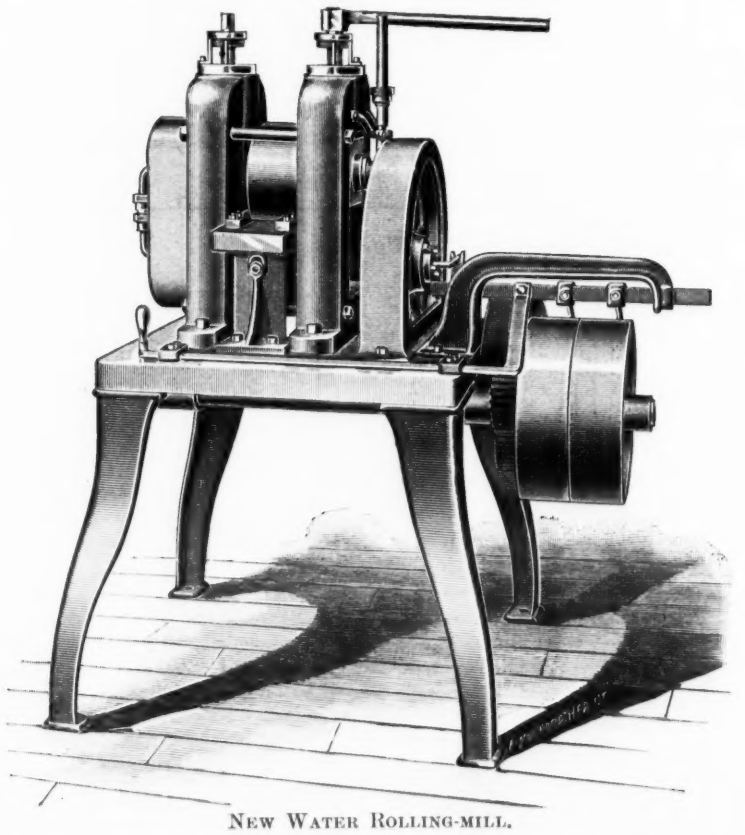


SPECIAL MILLING CUTTER.

New Water Rolling-mill.

The cut shown herewith represents a rolling-mill with water connections, which has been carefully designed for the purpose of rolling flat wire, watch and clock springs, or similar work that comes within the range of the machine. The rolls in this mill are made of the best Krupp cast-steel, and are hard and sound, with the finest lap finish on face. The arbors are made of tool steel, with hole running through to admit of the free circulation of water. The water enters one end of the top arbor, circulates through the arbor, and by means of the water connection, shown at the left of cut, is conducted to and through the lower arbor, thereby keeping the rolls and arbor journals cool, which insures accurate rolling running at high speed. The roll journal boxes are copper and tin. The shafts are made of the best hammered steel, and all gears are accurately cut from the solid stock. The mill, in construction, is very powerful, being geared 30 to 1, which makes it, for rolling flat wire or springs, a desirable machine. The adjusting screws in frames, as shown, are accurately cut, and on these screws there is an adjustable collar, which is graduated to read .001".

The weight of the machine is about 2,000 pounds. It is built by Blake & Johnson, Waterbury, Conn.



NEW WATER ROLLING-MILL.

Finishing Iron Patterns.

BY JOHN M. RICHARDSON.

Many an iron casting intended for a pattern would stand much higher in the opinion of the man about to finish it if its ancestry was traced back one generation to the master pattern, and this progenitor of a race of numberless offspring was constructed with a little more care, especially with regard to its lines and curves, taking pains to have them true and not just enough out so that they are ever afterwards an eyesore to a close observer.

The draft must be carefully attended to also, for it is vastly easier to plane and sandpaper wood than it is to file iron any more than absolutely necessary.

When the pattern reaches the foundry there is not usually much danger of impressing too strongly upon the mind of the molder what the casting is to be used for, and that it should be of good quality iron, very smooth, and free from all imperfections.

All precautions mentioned thus far will be amply repaid, for it is a tedious job to file and scrape away on faults which might easily have been avoided in the pattern room or foundry.

The next thing is to scrape and file the casting smooth, and make necessary holes for draw irons. The word smooth can be taken with a somewhat flexible meaning, according to what the job is, for on small pieces they should be finished up very nice and bright, while on much larger work, if it is brought down to a good surface free from bunches, even if not perfectly bright in every part, it will do, for the substance used for a filling which is afterwards applied will bring out a very even surface.

As molding sand will stick to bright iron, the pattern must be coated with some preventive, and perhaps the commonest way of all is to simply heat it and then hold a lump of beeswax in the hand, rub it all over the warm casting, and then wipe off the superfluous wax with a piece of waste or rag.

If this method is adopted, it is very much better to first thoroughly rust the pattern before heating.

Sometimes the casting to be used as a pattern is blued instead of rusted, that is, heated quite hot, enough so that it turns a bluish color, and then afterwards covered with beeswax.

Another method of finishing is to wipe them over with "blue water," which is done in this manner. Procure at the druggist's some lumps of blue vitriol and a little nitric acid, and take some of the vitriol, say a couple of ounces, and pound it to a powder, and pour it into a bottle holding about a pint, after which fill with water and about a teaspoonful or so of the acid, and shake the mixture thoroughly until all is dissolved.

This is used a great deal by machinists on smooth surfaces where they wish to lay out work with dividers or scratch-all, but it also makes a nice surface for a pattern, which will draw easily from the sand, and if the pattern has been worked down to a bright surface all over it will answer with nothing further being applied, for it instantly deposits a surface of copper everywhere the solution comes in contact, provided the work is entirely free from grease or oil. This must be remembered, and any grease spot carefully cleaned. This is easily done by wiping over with hot water or rubbing with chalk.

An additional coating of the mixture of black lead, beeswax and turpentine, which a contributor to the AMERICAN MACHINIST described some time since, gives the pattern a smooth, slippery surface, by warming it and applying the preparation and then wiping off the superfluous covering while it is still hot.

On work where not so much labor has been expended in the finishing with file and scraper, and the parts are not quite smooth, I can recommend the following to give a very satisfactory result, although it takes a somewhat longer time.

First wipe the casting over with the blue solution; this gives a copper surface on all the bright parts, but does not do much good on the rougher portions, so melt some beeswax and stir in the black lead until it is the consistency of dough, and thin with turpentine till of the thickness of paste. Next warm the pattern and give it a good coat all over with the preparation, and put it away until cold. This acts as a filling, and it is then necessary to scrape it carefully off again to obtain an even surface.

A putty knife blade held quite flat does very well to remove what is unnecessary, and what is needed remains and hides any roughness of the pattern. Lastly, rub it carefully over with very fine sandpaper, taking care not to remove the copper surface at any point.

I have found a steam glue heater an excellent place to mix up the preparation and

keep it hot, and there is no danger of igniting the turpentine, as there would be over a flame.

Finally I will mention the bayberry tallow process, which, for patterns that have been finished to a nice even surface to start with, is superior to others, in my opinion.

Bayberry tallow is a vegetable product, found as a film or blush on the outside of bayberries which ripen on low bushes in the autumn, and is separated from them by boiling, the tallow then rising to the surface. When cold it is much harder than beeswax and somewhat lighter in color, having an aromatic odor and feeling very slippery to the touch.

Its uses are quite varied, and it can usually be found in drug stores.

To prepare it for use on patterns, melt it, adding enough turpentine so that when cold again it will be about the consistency of butter. The pattern should be first rusted or else covered with the copper solution previously mentioned, and then rubbed over thoroughly with the tallow. This leaves an extremely smooth, shiny surface, and it is clean to handle and has the advantage that it is not necessary to heat the mixture after being once made, in order to apply it, or the pattern either, without one chooses; thus a pattern can be kept in fine condition continually if a molder will provide himself with a can of the preparation, and keep it on his bench and occasionally rub over the pattern with it before going home at night, when the next day it will be found hard and ready for use, as the turpentine will then be evaporated.

While I may not have offered anything very original, still I believe that some points will be helpful to many. As these are probably not all the ways nor the only ones in use, I shall not go so far as to claim any one of them to be the absolutely best method which can be devised.

Pouring, Flowing-off and Feeding Castings—II.

BY S. BOLLAND.

Fig. 16 (September 29) illustrates a system of dams set before the castings when it is desired to produce clean work from a spray. When best results are looked for, all such gates should be connected with the patterns on a match board, so as to insure a good hard surface for the molten iron to pass over. Gates cut with tools are, as before stated, untrustworthy, on account of the soft, broken surface yielding to the extreme heat to which they are subjected, and thus forming slag that invariably finds its way into the casting.

The form of the leader, in this instance, is a noteworthy feature; the iron entering at *A* travels rapidly along the smooth, round surface of the leader, passing the gates and out at *C*, carrying a large proportion of the dirt along with it; whatever portion remains is held on the upper surface of the leader whilst the casting is being fed from the bottom. The dams *D*, as seen, are formed with cores, and make "assurance doubly sure" by checking any inflow of dirt, should the pouring from any cause be lacking in force.

There is no other casting that has helped the science of running as much as the governor ball. During the early part of my apprenticeship this job was held back for some particular man who alone could be trusted with such an important job, and not unfrequently have I known the best men to fail time after time to produce a casting that was clean all over when turned.

The manner of running a ball which must be turned bright is shown at Fig. 17, where it is seen that the metal passes down *A* into the ball at *B;* the direction given the metal by this form of ingate causes the metal to revolve rapidly in the mold, and this causes the lighter substances which gather on the surface to collect towards the center, as indicated by the arrows in the plan, to be ultimately ejected at the riser *C*.

The principle involved to keep the ball clean must naturally suggest the propriety of filling other molds from such a ball whilst the dirt is being held a prisoner in the middle of the swiftly rotating mass, and just how this may be accomplished is shown at Fig. 18, where a number of castings, directly connected with a central ball, may be fed with comparatively pure iron, with no possibility of dirt other than may be gathered within their own limits. Unless in large castings, there need be no riser on the ball when it is used for running purposes.

Fig. 19 shows how the principle may be made general and used for almost any class of work.

Fig. 20 illustrates two methods of running pipes or columns at the flanges, the gates *A A* being intended when it is desired to run down through the cope, and the one at *B* to be used when it is thought that the former plan would be too hard on the mold at that point.

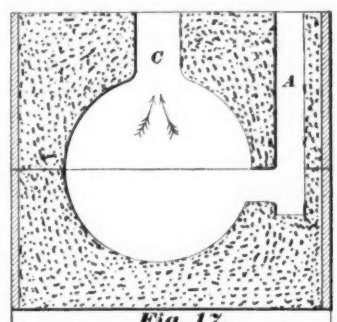


Fig. 17.

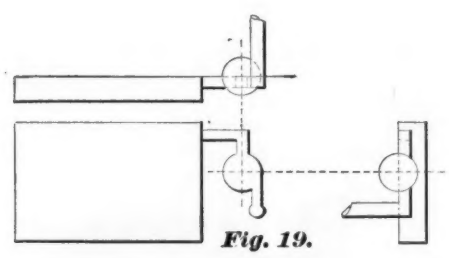


Fig. 19.

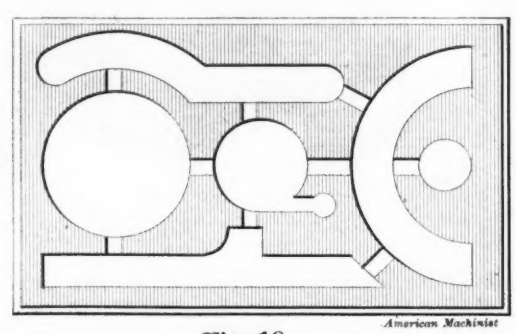
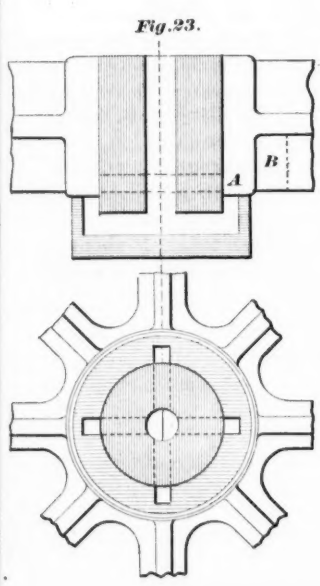


Fig. 18.



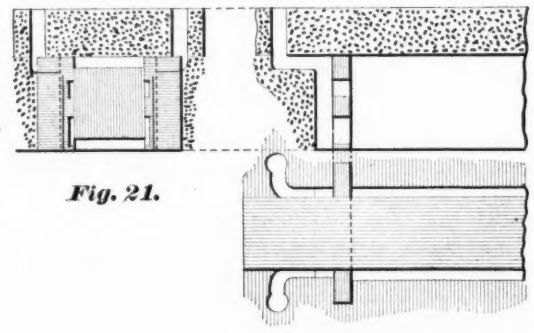


Fig. 21.

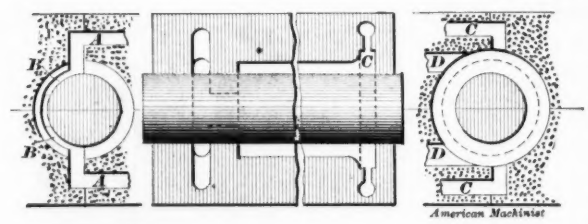


Fig. 22.

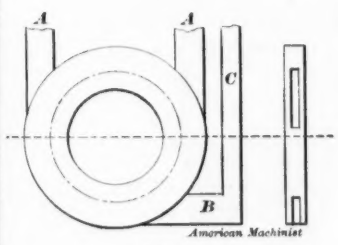


Fig. 20.

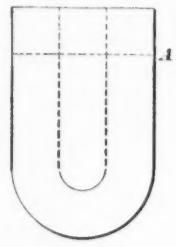


Fig. 27.

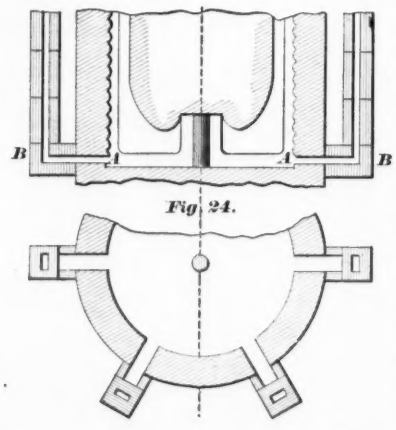


Fig. 24.

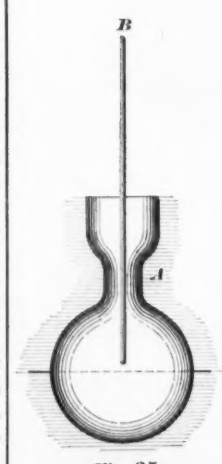


Fig. 25.

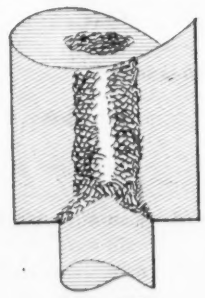


Fig. 26

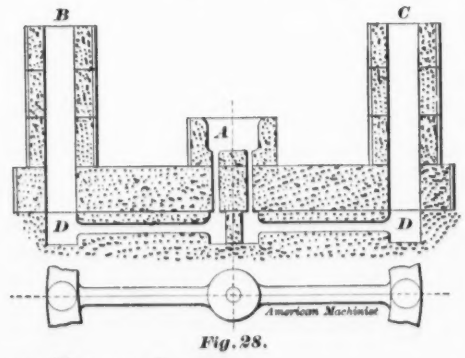


Fig. 28.

POURING, FLOWING-OFF AND FEEDING CASTINGS.

The regulation method of running square columns is shown at Fig. 21. All such columns will run from one end, under ordinary head pressure, 17 feet at one inch thick if the iron is in good condition; beyond this it is unwise to go, especially if the column should be less than one inch. I speak now of how far metal will reach in such work; but as the method of running long columns all from one end conflicts with the first principle of filling molds with iron of equal temperature, it is very evident that all long castings should be filled from both ends. The wisdom of the above always strikes us the more forcibly when we see any violation of these principles result in a cracked casting.

Keep all risers away from brackets; for should there be but a very slight commotion in the mold the bracket is sure to suffer if the disturbance finds a vent at that point.

When the flask will admit of running round columns at the end it is by all means the best plan to adopt, and the best kind of runner for this purpose is shown at Fig. 22, where main runners *A A* are seen to connect with a circular runner *B*, cut round the bearing and entering the casting at one or more gates ample to run the column safely. Round columns will run 18 feet ⅛ inch thick from one end, providing all other things are favorable; but the remarks on square columns apply with equal force to round ones, and risks should not be taken.

Sometimes it is found advisable to change the location of the runner; if this must be done, choose some flange or collar into which the gates can be directed either on the side, as seen at *C*, or dropped down at *D*.

Fig. 23 shows how to run a large wheel through the hub core. The center dry sand core, with a hole large enough to fill the mold at a proper rate, rests on another dry sand core in which the requisite gates have been prepared. To save making the bottom core, holes for gates may be made at *A*, indicated by broken lines, but this plan is somewhat risky, if the noses against which the iron beats are not made in dry sand, as seen at *B*.

It is plain that a wheel filled after this manner is preferable to any other, as it makes what is otherwise a critical job a very safe one, and insures a good casting every time, at least so far as the running is concerned.

Fig. 24 is a plan and elevation of a spiral drum, or at least as much of it as will serve the purpose of showing how to arrange for a system of bottom gates when such gates must be made in the pit around a brick mold. Where the pits are damp it is absolutely necessary to have the gates protected from the moisture.

The method shown needs no explanation other than can be discovered by a careful examination of the figure. *A A* are the gates prepared in the mold, against which are set cores *B B*, these again being surmounted by other cores, as seen, until the top is reached. If the mold is unusually long, and there is danger of the metal becoming too sluggish to fill the upper parts of the mold correctly, then apply the gates on the top, after the manner as fully explained in "The Iron Founder," page 163.

The utility of feeding castings is questioned by some, but a little reflection will, I am sure, lead all who deny its efficacy to see the erroneousness of their conclusions.

The ball shown at Fig. 25 is supposed to be 12 inches in diameter, and suppose that such a ball was cast (without riser) with hot iron, and left to cool in the same position it was cast; it is certain that the upper surface would have fallen in, in proportion to the amount of shrinkage which would have taken place before the crust was firm enough to sustain itself; the amount of shrinkage would, of course, be according to the nature of the iron it was cast with. Now if this ball, when cold, was split in two, it would be found that the upper hemisphere would show a sponginess similar to that seen in the sectional illustration at Fig. 26. The figure

quoted is a good illustration of the point under consideration, being a sectional representation of a piece of roll cast from inferior iron; the internal shrinkage, unsupported by any system of feeding, causing the sponginess at the heart and very evident fracture at the neck.

Mortars such as shown at Fig. 27 were formerly cast solid, with a shrink head from *A* up. The head was afterwards turned off and the casting bored out to the broken lines. And yet, with the head cast on, as shown, it was never deemed advisable to risk a cast without keeping the heart free from scum, so that a constant supply of hot iron could be introduced to fill up the space which gradually forms as the shrinkage takes place.

Now in the ball shown at Fig. 25 we endeavor to reach the heart of the casting through the riser *A*, which is made no larger than will just serve the purpose of feeding the ball. (In the former instance no riser was supposed to be on.) If the mold now under consideration was left to take its own course after being cast, the natural feeding would occur as long as the iron in the neck of the riser remained fluid; but, as shown by the shaded lines, by the time the neck was solid there would still remain a considerable area of iron in a molten condition, and it is at this juncture that the rod *B* gets in its fine work by simply keeping open a communication between the upper and lower bodies by a constant supply of hot iron from the cupola. This is not, as some seem to think, a sort of pumping or forcing of the iron below; the motion of the rod exercises no influence whatever, only to preserve a free channel through which the hot iron can pass into the shrinking mass below.

Excellent results may be obtained by pressure feeding sometimes, as illustrated at Fig. 28, which figure is intended to show how to feed the solid rim of a gear blank by "freezing" the runner *A*, immediately the mold is full, and afterwards pouring hot iron alternately down risers *B* and *C*, so regulating the operation that the body of metal below at *D* may be kept in motion as long as it remains in a fluid state.

The possibilities of making such a casting solid by this method of feeding are considerably enhanced by the augmented head pressure, which in this instance is 1 foot 6″ more than would be the case ordinarily. Still it must be evident even to the least observant that this method has its limits of usefulness clearly defined, and can only be resorted to when the riser and casting are of equal magnitudes, or nearly so.

When this is the case the process of solidifying proceeds equally and uninterruptedly from the outside, *at both riser and casting*, the shrinkage of the contracting mass being made good at every step by the constant and increasing pressure of liquid iron, which is being forced through from above; but it must be observed that certainty of results can only be reckoned on when this entire operation is continued until the point of congelation is reached.

As proof of the above, let a riser of the same dimensions be applied to a body of larger area, and, no matter how hot the supply or how high the pressure, the riser will have congealed long before the heart of the casting, as is clearly demonstrated at Fig. 25, making it absolutely imperative that the feeding rod be used, as heretofore explained, or that pressure and area of riser be increased commensurate with the increased magnitude of the casting.

On the Cultivation of the Inventive Faculty by the Solution of Constructive Problems.

By Leicester Allen.

Further solutions of the problem given out in the American Machinist for July 28th have been received. A very neatly drawn and clearly explained solution has been sent in by Mr. Walter Gribben, of Brooklyn, N. Y. The explanation, however, would have been somewhat easier to follow had letters of reference been used by Mr. Gribben, and, while otherwise quoting his own language in the explanation, I have taken the liberty to supply these. Mr. Gribben writes:

"The constructive problems that have appeared from time to time in the American Machinist have interested me greatly, and I thought I would try and devise a solution for the one propounded in the issue of July 28th.

"After some preliminary drawing, I assembled the thing as a whole, Fig. 1, but if I were drawing it again I would either make it revolve in the opposite direction, or else place the supporting column on the other side of the shaft, that is, the side toward the observer, so as to bring the strain of the roller in Fig. 9 towards the column instead of away from it, as I have drawn it.

"I construed the words of the problem to mean that there was no appreciable rest between the rotation and lowering of the hub. I have let the hub drive the shaft, and have allowed the hub to gravitate at the end of its rotation, no limitation having been fixed on these matters I have selected one-fifth of a turn for each rotary movement of the hub.. I am unable to decide upon the number of mechanical 'elements,' but will leave you to determine whether or not they fall within the prescribed limits." [The number of mechanical elements are well within the number named. L. A.]

"Figs. 1 and 2 are full size. The others are half size.

"The apparatus consists of a vertical shaft *A*, carrying a driving pulley *B*, a gear *C* of seventy-two teeth, and a releasing cam *D*, shown developed in Fig 8. The seventy-two gear *B* drives another, *E*, of sixty teeth, fast on the shaft of the lifting cam *F*, shown developed in Fig. 5, in plan in Fig. 6 and in elevation in Fig. 7. This cam and shaft I have shown all in one piece; but it would have made a better construction to have a hub and a set-screw on the bottom of the cam. The top end of this shaft is bored out to receive a journal turned on the bottom end of the given spindle shaft. The shoulders at the extreme top and bottom bearings prevent any end motion. Surrounding the lifting cam *F* and its shaft is the stop cylinder *G* and its tubular shaft *H*, shown as formed in one piece. The stop cylinder is shown developed in Fig. 3, in plan in Fig 4, and in elevation in Fig. 9. The stop cylinder has a stud *a* driven tight in one side, the projecting part of the stud carrying two loose rollers *b b′*, the roller *b* playing in a slot in a bracket *c* attached to the column *I*, allowing the stop cylinder *G* to rise and fall, but preventing it from turning. The roller *b′* travels in a groove of the lifting cam *D*.

"The stop cylinder, besides five equally-spaced slots, *d* d_1 d_2, etc., has a plain groove *e* turned in its inner face near the bottom, in which travels one arm of the bell crank *f*, pivoted to the bottom of the lifting cam (bearings not shown). It might be well to provide the short arm of the bell crank with a roller, but it will hardly be necessary if the bell crank rock-shaft be made as long as the space will permit. The lifting cam *F* is divided into three (not necessarily equal) parts, a lower rest, a rise, and an upper rest. The fall is abrupt.

"In the position of parts shown in Fig. 1, the period of lower rest has just begun. The lifting rotates under the given arm (which is shown in one of the slots of the stop cylinder, and hence cannot revolve), the arm remaining down while the lifting cam is making one-third of a turn; then, while the lifting cam is making another third of a turn, the arm rises in the slot. While the last one-third of the lifting cam is being made, the arm remains at rest, being held from rotating by the ratchet shaped tooth *g* of the stop cylinder. At the end of this period of rest the roller will have arrived at the lowest point of the releasing cam, and the stop cylinder will have been lowered sufficiently for the arm to pass over the ratchet-shaped tooth *g*, lowering the stop cylinder, also causing the long arm of the bell crank to come in the path of the angle-piece *h* riveted to the side of the arm, and rotate the arm as well as support it against falling.

"By the time the arm has rotated over one fifth of the circumference of the stop cylinder, the latter will have attained its normal height, and brought another ratchet-shaped tooth in the path of the arm to stop its rotation, besides throwing the bell crank into the position shown in Fig. 1, and allowing the arm to drop.

"You will notice all movements, except the dropping of the arm, are positive. In the gear wheels the pitch cylinders are only drawn, to save labor in drawing."

This is a movement that evidently has been very carefully thought out. The principle of the device can be made to operate for a wide range of particular cases. An analysis of these possibilities sent in by Mr. Gribben is very interesting and instructive In addition to the explanation above quoted, he says:

"Although I have shown the device arranged for one-fifth of a turn of the hub during each cycle of movement, it could be adapted for any other fraction of a turn just as well.

"The stop cylinder should have the number of the slots equal to the denominator of the fraction expressing the portion of a turn the hub is to be given, and the gears should be in the ratio that the denominator of this fraction bears to the *sum* of the numerator and denominator. Thus, in the drawing (arranged for one-fifth turn) the stop cylinder has 5 slots, and the gears are in the ratio of 5 to 6. Had it been desired to give the hub $\frac{2}{5}$ of a turn each time, the stop cylinder would then have 9 slots, and the gears be in the ratio of 9 to 11. For $\frac{4}{21}$ of a turn the stop cylinder would have 21 slots, and the gears be in the ratio of 21 to 25.

"This rule also holds where it is desirable to give the hub more than a whole turn each time. For instance, if, after the lower rest, rise, and upper rest, the hub was to be given $1\frac{2}{3} = \frac{5}{3}$ turns, then the stop cylinder would have 3 slots, and the gears would be in the ratio of 3 to 8. Where the numerator of the given fraction is 1, the releasing cam can be made as I have drawn it; but where the numerator is greater than one, the releasing cam will have to be so made as to allow the stop cylinder to stay down long enough for the arm to pass over the requisite number of teeth.

"The length of the lower rest on the releasing cam can be found by dividing the numerator of the given fraction, less one, by

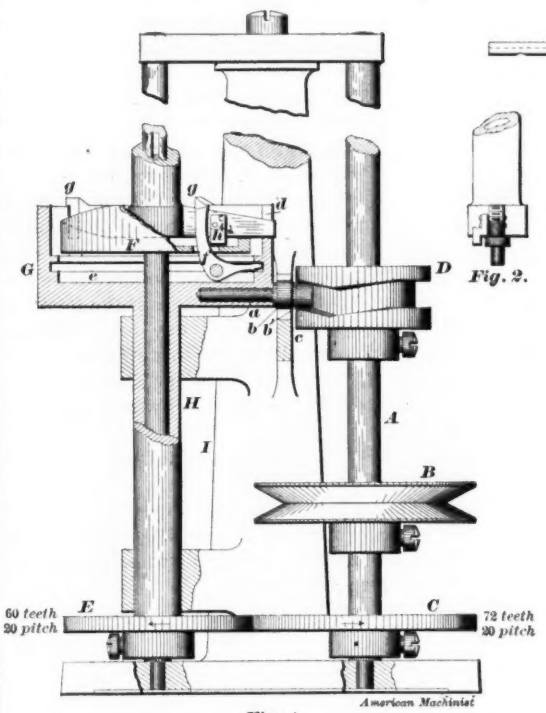


Fig. 1.

Fig. 2.

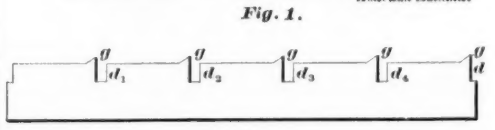
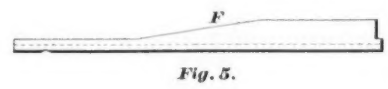


Fig. 3.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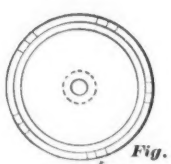
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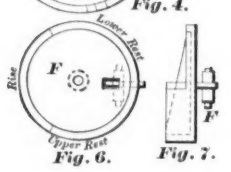


Fig. 6. Fig. 7.

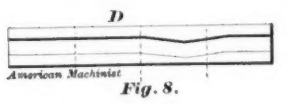


Fig. 8.

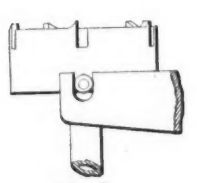


Fig. 9.

Fig. 11.

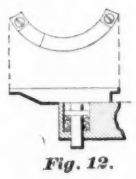


Fig. 12.

Fig. 13.

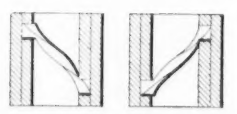


Fig. 14.

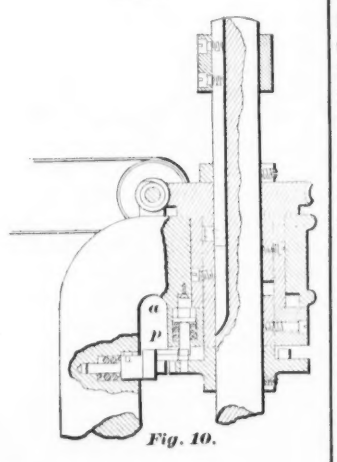
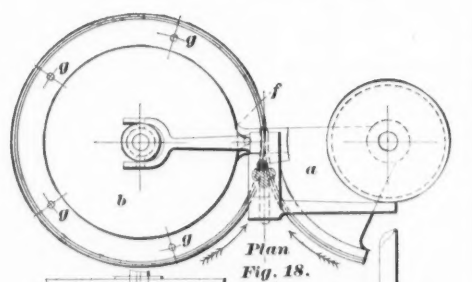
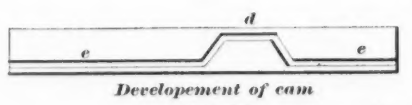
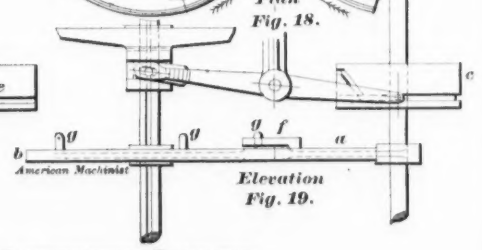


Fig. 10.


Plan
Fig. 18.


Developement of cam
Fig. 20.



Elevation
Fig. 19.

Solution of Constructive Problems.

the sum of the numerator and denominator. Thus for $\frac{3}{5}$ of a turn of the hub, the lower rest on the releasing cam would have to last through $\frac{1}{11}$ of the circumference. For $\frac{4}{11}$ of a turn of the hub the lower rest of the releasing cam would last through $\frac{3}{25}$ of the entire circle. Again in the case where the hub is given $1\frac{3}{8}$ or $\frac{5}{8}$ turns each time the lower rest on the releasing cam will occupy $\frac{3}{8}$ or $\frac{1}{3}$ of the circle.

"The relative duration of the upper and lower rests of the hub and the time of rising can, of course, be varied by changing the angular values of the rise and rest on the lifting cam. In the arrangement I have shown in the drawing, the hub would always fall at practically the same speed, regardless of the speed of the driving pulley. It has occurred to me, however, that the fall on the lifting cam need not necessarily be abrupt, but can be as gradual as the rise, if desired."

If any further confirmation of the mental discipline the solution of mechanical problems affords were needed, the explanation and analysis of Mr. Gribben's device, as above given, would supply it. I ask a candid consideration on the part of skeptics (if there be any skeptics) of the question whether such a solution, wrought out with painstaking, and such an analysis, grasping exhaustively, as it does, the numerous particular cases to which a mechanical movement is applicable, is not as likely to strengthen reasoning power, and that other important faculty of the mind, the power to hold several related things in distinct mental view simultaneously, as a problem in analytical geometry would be? Will not any student, rising from the completion of such a piece of work, find himself better able to cope, not only with a far more difficult mechanical problem, but with any problem requiring a cultivated intellect for its comprehension and discussion? This comment is in harmony with the avowed intention contained in the first of this series of articles—the intention to test—and, if possible, to prove the great educational value of this kind of mental exercise.

A very good solution has been sent in by Mr. J. K. Love, of Waterbury, Conn.

Referring to Figs. 10, 11, 12, 13, and 14, Mr. Love explains his solution as follows:

"As I understand the problem, the hub (after each period of rest) is to slide upward a definite distance, and remain at rest a definite period of time, at the expiration of which both the shaft and hub must be horizontally rotated a specific distance, less than a quarter circle, and when the rotation is finished the hub is to be lowered without rotation, and *without rest*, to the height it occupied at first. What I mean by *without rest* is that, after the rotation is completed, the hub is to be lowered immediately. If I am in error on this point, it is simply a matter of changing the cam to suit the requirements of the problem." [Mr. Love understands the problem as I intended it to be understood. L. A.]

"Fig. 10 is a vertical section of the mechanism, showing the method of raising and lowering the hub, which is accomplished by the internal cam, Fig. 14 (operating by means of a roller attached to it), the sliding key which is fitted into the spline. This spline is made unusually large, for the sake of strength. The drawing shows how the key is fastened to the hub. The shaft is rotated by means of the cam piece, Fig. 12, fitted into the circular cavity at *a*. This piece operates to force downward the pin *p*, which engages with one of the pins on the index plate, Fig. 11, carrying it around one-fifth of a revolution, after which it swings back into place, passing over the remaining pins until it is again forced downward at the proper moment. The plan of the index plate is clearly shown in Fig. 11, with the method of locking it. Fig. 12 is a view of the cam piece. Fig. 13 shows the lines and divisions of the cam. The small circle in this figure represents the position of the roller, while the shaft is rotating. Fig. 14 shows the cam in section."

Mr. Love's solution is a good mechanical construction to effect the movement required. Another offered by a gentleman of Spencer, Mass., is a simple and good solution, which I regret I am forced to omit, as it is not accompanied with the name of its author. I will retain this, and if the gentleman forwarding it will kindly send his address to the editor, I will, if the same be forwarded to me, notice the solution in a future article. It must be obvious to all conversant with the business of publishing a newspaper, that anonymous communications cannot receive notice. The real name *must* be given in the communication; and, if correspondents desire it, a fictitious name may be used in the publication. As it is not unfrequently necessary for me to seek additional explanation from the authors of these solutions, I cannot establish the precedent of noticing such as are sent in anonymously.

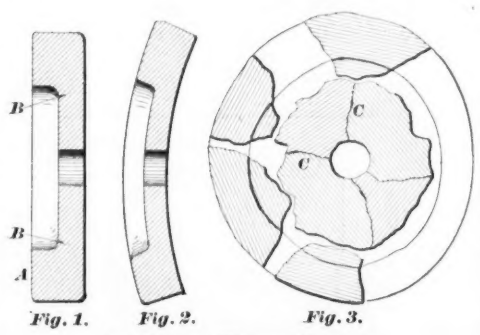
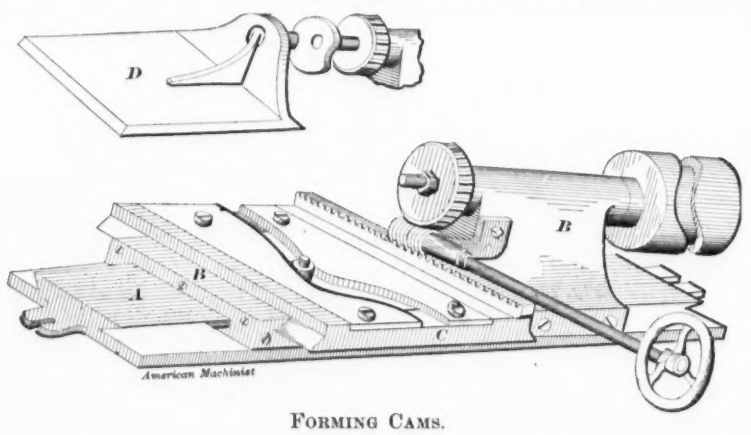


Fig. 1. Fig. 2. Fig. 3.

AN EMERY WHEEL BURSTS.

A solution sent in by Mr. Geo. S. Currie, of Elgin, Ill., is illustrated in Figs. 18, 19, and 20.

The horizontal motion of the hub and shaft is effected by a segmental gear *a*, which meshes into a continuous gear *b* on the shaft which is to be moved, the latter moving freely in a vertical direction through the hub of the gear *b*. The lifting of the hub is effected by a bifurcated lever of the first order, operated by a pin and roller playing in a groove of a cam *c* keyed to the shaft of the segmental gear. The development of the cam is shown in Fig. 20. The period of upper rest occurs at *d*, Fig. 20, and that of lower rest at *e*. A fork *f*, attached to the segmental gear *c*, engages successively with the pins *g* on the gear *b*, to insure the intermeshing of the teeth. While this will effect the movement desired, I do not think it to be good mechanical construction to use gearing of this character if it can be avoided by more positive mechanism. This may be a rooted prejudice rather than an opinion based upon substantial reason. However, as has been reiterated, the solution of the problem is not limited to best mechanical construction. Perhaps on further reflection Mr. Currie can see a way to effect the horizontal rotation in a more positive manner, without changing the lifting mechanism, the latter being very simple and mechanical.



FORMING CAMS.

A prisoner, for some trifling offense we believe, sawed off three one-inch bars in the Hudson County, N. J., jail and gained his liberty. If he had turned his earlier attentions to honest matters he would probably have been an ornament to the machinists' or some kindred trade. It makes a very material difference how one uses his talents.

LETTERS FROM PRACTICAL MEN.

An Emery Wheel Bursts—A Reasonable Result.

Editor American Machinist:

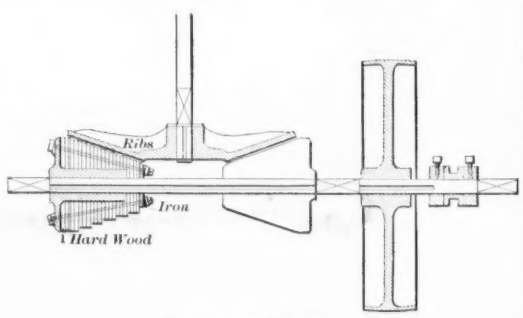
An emery wheel on a twist drill grinder in my shop burst, and the only reason nobody was killed is that nobody was in range at the time.

Now, if that emery wheel was defective in material, or badly handled, it would be an old story about which nothing new could be said, but I am convinced that the accident was due to a defect in the shape of the wheel, and was one that can be reasonably expected to happen to any wheel of that shape, and therefore the matter is of general interest. The defect exists wherever that particular twist-drill grinder is used, and any such wheel may burst the way mine did, and for the same reason.

The wheel was of the shape shown by Fig. 1, being cupped out to half its thickness, so that the twist drill being ground could be worked on the face *A*. Now, where is the strain in the body of the wheel due to centrifugal force? It would appear to me that the wheel tends to bend into the shape shown by Fig. 2, and that a flexible wheel would take that shape.

But the material is not flexible, and therefore there is a breaking strain at the weakest point, the point *B*, where the thickness, and consequently the strength, begins to increase. When the break comes the wheel should part in a ring at *B*.

That is exactly what happened. The broken pieces, being placed together as nearly as possible, show as in Fig. 3, the thin center broke in a ring, the heavy rim was shattered to fragments, and the center piece separated into four pieces by radial breaks *C*, which are clean breaks that can be put together accurately.



FRICTION WHEELS.

It seems to me that that wheel burst because it ought to have burst, because it was carefully planned to burst, and that any wheel of that shape may be reasonably expected to burst and lay out any poor machinist who happens to be in the way of the flying fragments. I must tolerate the presence of a boiler that may burst, because it is necessary, but if I allow another emery wheel of that shape to be run I must hold myself responsible for the consequences.

GEORGE B. GRANT.

Lexington, Mass.

Friction Wheels.

Editor American Machinist:

In your issue of August 4th, 1892, F. H. Colvin says he would like some information about those straight and bevel frictions that Steam Feed spoke about; but he may not be able to give the information that some one else might do. I will state a few facts that I know from experience. I inclose a sectional view sketch of a pair of 18"x1" paper bevel frictions on a $2\frac{15}{16}$ shaft; also 4" x11" pulley and shipper collar for working shaft endwise by means of lever and suitable connections. The frictions are to drive 44x14 bevel iron friction on end of $2\frac{15}{16}$ shaft, the shafts being on a right angle with each other. The angle of frictions in sketch is not proper, as the angle line should start from junction of center lines of shafts. The iron friction should be polished with a piece of emery stone. The paper friction sleeve flange here shown is used where size of friction on small end will not admit of loose flange to fit on end of sleeve. In straight face and some bevels the loose flange is bound to slip on outside of sleeve, which should be turned. The paper is cut with a revolving tool in drill press both inside and outside; the tool is on the same principle as a gasket cutter; a hardwood table to be used under the paper and on top of drill press table. Four or five washers of same size may be cut at a time before changing the tool, so that when they are put on the sleeve they will resemble a cone pulley, as shown at lower half of sketch. For straight wheels they would be all cut with one setting of tool.

The friction paper used comes in sheets about $\frac{3}{16}$" thick, 34"x46". It is best to lay out sheet with dividers and get the most number of washers possible from each one. When the paper is placed on sleeve and loose flange on top a temporary bolt may be passed through shaft hole and nut screwed down on loose flange; then the bolt holes may be drilled through the iron and paper with a twist drill. If there is none long enough, weld a long shank on an old one. The tool that I spoke about in a previous issue cannot be beat for the job. The round cutter arrangement used twenty years ago by one that had a good deal to do with building a saw-mill is not what he cracked it up to be. The iron and paper frictions are extensively used in the best saw-mills of the country, where nothing would answer the purpose as well. When they are put in their proper places and properly constructed they are a success. They would answer in Mr. Colvin's case, but my opinion is that the belt is better where there is room enough and a continuous motion. I know that from experience. The wood and iron cog gears would do very well; but where room is limited and a reversible motion is wanted the frictions can't be beat. As will be seen in sketch opposite, motions are obtained by shoving the shaft one way and then the other, making one paper wheel to bear against the iron, or driven one at a time; it is customary to make the paper friction the smallest. In straight-face frictions, eccentric or sliding boxes may be used in getting the contact of frictions. The arrangement shown in sketch is in practical operation. The frictions are able to handle the power transmitted by 10" belt on driving pulley. I have no formula at hand for the power of frictions, but would be pleased to see one. The practical experience I think goes a long ways in designing paper and bevel frictions. I might write a good deal about the subject, but for fear it would not be interesting, and infringing on too much valuable space, I will make this article short. There may be some one that can give the subject more justice; but if Mr. Colvin is building some frictions, we will say bevel, when he has determined the size of them it will be an easy matter for him to lay out the proper angles, and proceeding as I have stated I think he will find no trouble in building and running paper and iron frictions.

STEAM FEED.

Forming Cams.

Editor American Machinist:

In reading the articles on cam movements, by A. D. Pentz, he shows Fig. 10, in September 15th issue, as the best practice in making cam models, but I beg to differ with him, as the accompanying sketch will show. Where he has the curves on the edge of the

cam to contend with I have not, as I use flat plates; the cam curves developed upon them, and fastened to the slide *C*. As the worm controls the movement of both the spindle and slide, the speed is the same in both. The slide *A* can be fastened to any milling machine platen; a pin with a roll is driven into it, and passes through the cross-slide to the former, which drives the spindle head *B B* forward or back as the spindle rotates. The length of the formers is the circumference of the worm gear on the pitch line plus what is necessary for fastening. In using this fixture you would have to keep this in mind in timing cams, as the same length of former does for all sized cams. By hinging head *B*, and removing slide *C*, and replacing by angle plate *D* with roll on, and placing former on spindle extension, you can cut any shape or kind of cam with the same fixture. This may be an old idea, but was new with me.

C. F. SMITH.

Flies and Drawing Ink—Learning—American Boasting.

Editor American Machinist:

It has been my experience to find flies with a very decided penchant for Higgins drawing inks, and have found muriatic acid a good antidote to drive them back to their proper sphere. I tried hartshorn, but don't know whether the flies became accustomed to the combination or evaporation took place.

I take exception to your rubbing fresh ink every morning and noon, because it takes time; time is money, and, furthermore, a draftsman cannot "think" and rub ink at the same time.

W. goes at the kernel of the nut in good shape in his "Practical Talk to the Boys." The apprenticeship question is one that demagogue workmen and fool employers always try to combat and surround with mystery. My advice to the young man determined to succeed as a mechanic, is to go on and up. Don't change from your present place for the sake of more pay, but if you are not *learning* now, change to the shop where you will learn, and opportunities be given for you to learn.

I would just like to say one thing on the "American Boasting" discussion Mr. Sweet has not said one word about any other nation's boasters. I have put a Yankee and an English engineer together, and two greater braggarts I never listened to; they had performed wonderful things, but not half so great as they imagined. The Scotchman does not brag much; he is after pelf. The German is a combination of the Englishman and Yankee in boasting, and excels his English brother in copying and purloining the products of others' brains. But the nervy Frenchman, with his electric waltzing from alpha to omega in mechanics, and back again, searching for ways and means to accomplish desired results, without ever telling us who he was or where he came from, and his more slow-going, colder blooded brother mechanics from Norway and Sweden have always been my ideals. Being a student of human nature, as well as a mechanic, I have long noted these things, and feel that my friend Sweet is perfectly justified, so far. There is an old and true proverb, thusly, "He that humbleth himself shall be exalted." This has been Professor Sweet's maxim throughout his mechanical life, and unconsciously too, I think. How many of us who stand ready to score and criticise his honesty in "giving the devil his due" can say the proverb fits us?

THE OLD MAN.

American Boasting.

Editor American Machinist:

"Spare the rod and spoil the child" is perhaps one of the most practical proverbs in the language; at all events it is so, without doubt, in the opinion of the child.

American machinists are favored in having so judicious a wielder of the rod as they possess in the person of Prof. Sweet. To be brought to task for one's shortcomings is a most salutary exercise, and cannot fail to benefit. As a rule, if you want to know your failings, and have them shown up full size, it is only necessary to apply to one's neighbors. Now over here in the old country I believe I should be safe in saying that nine persons out of ten, if asked the question, would say: "Americans! Why, of course, they are all boast"; they would probably say so, whether they knew anything about Americans or not, as it is generally accepted as an axiom on this side the water. Where there is smoke one is justified in suspecting fire.

Personally, however, I believe that what we so generally put down as brag on the part of our American cousins is more a matter of habit, a national habit, than a real intention to boast. If we get down to the bed rock of the thing, the real intentional boast, I believe we should find as great a proportion, especially of mechanical boasters, in Great Britain as in the United States; at all events, if not boasters, individuals who possess a most gigantic opinion of themselves, which amounts to the same thing, and unfortunately we generally find that this class of people base their pretensions on a most quicksandy foundation, and that real merit loves seclusion. It is to be hoped that those Americans who do boast are more justified in doing so than we find their prototypes over here to be. There are few civilized countries who do not possess some, perhaps many reasons for national pride, and which may be far from the region of boast; but in this matter it is for we machinists and engineers to confine ourselves to our profession. Myself, as an engineer, I ignore the demarkation of territory; as an engineer I claim the world as my country, and all engineers as my countrymen. I feel nearer akin to that brown-skinned fellow-creature and fellow-machinist who made the curious ball, or to that African smith who forged those curious chains, or to that American who made that highly-finished automatic screw machine, than I do to my lawyer neighbor next door, and wherever my profession achieves a triumph of ingenuity, of skill, of accuracy and finish of workmanship, I share in the pride of it—it may be in my own little works, it may be in India, Japan, Germany, America, I care not where; I do not quarrel as to what particular country belongs the honor of the steam engine, the electric dynamo, or any other mechanical triumph over nature; the honor is ours, the pleasure, not the boast, is ours, we machinists and engineers.

As machinists we are working in different countries and under different conditions. We may learn from each other and admire each other's good work. Our endeavor should be by our works to show the best that can be done under the conditions we are placed in. It is our destiny, more than that of any other profession, to alter the face of the world, to open up and utilize her resources for the benefit of mankind. You of us in America are showing us how to make machine tools, Corliss engines, etc., and how to illustrate them and print their description, and you have shown us the way in systematic production, which is the best thing, perhaps, you ever have shown us. We others in the rest of the world are also doing something; let us waste no time in boasting of what we have done, but show the world how much better we can do.

FRANK LESTER, M. Inst., M. E.
England.

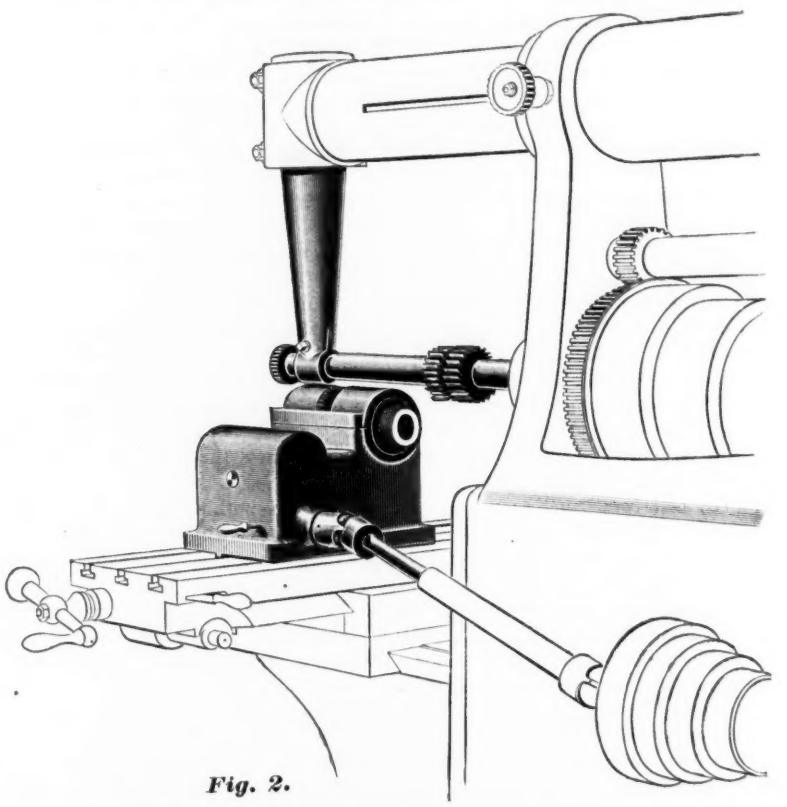


Fig. 2.

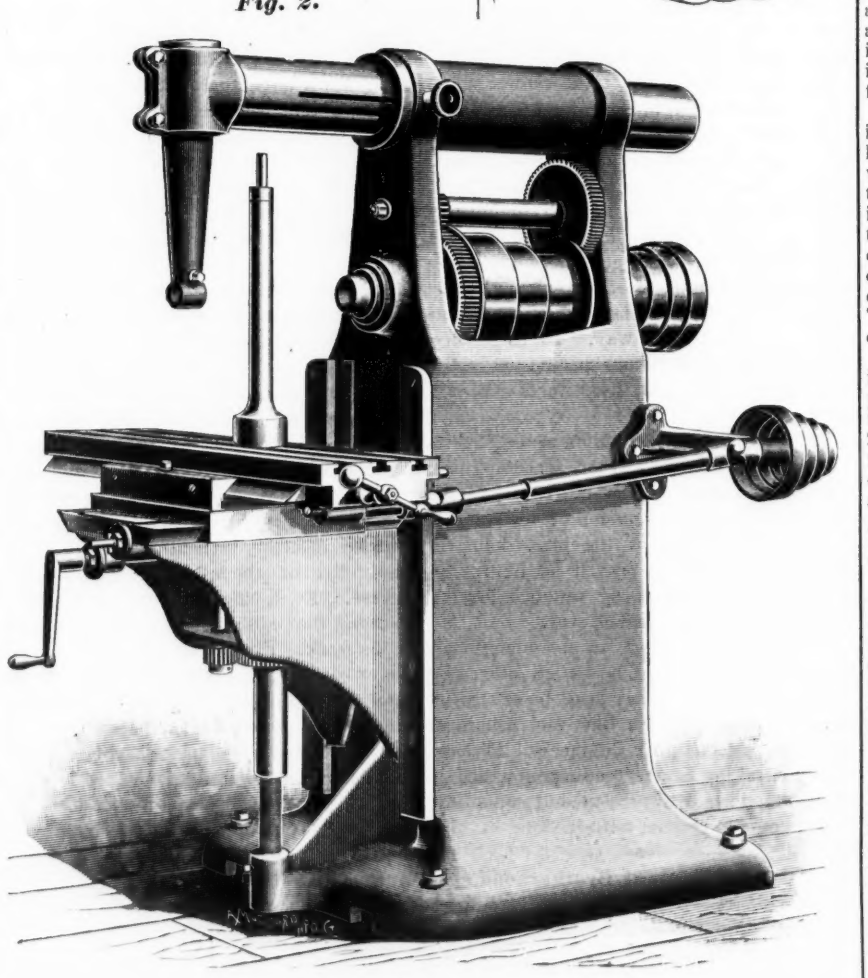


Fig. 1.

NEW MILLING MACHINE.

New Milling Machine.

The accompanying illustrations show a new milling machine, and a patented circular milling attachment recently put on the market by the States Machine Co., of Hartford, Conn.

Fig. 1 shows the milling machine, and, as will be seen, its construction possesses stability, compactness and simplicity; it also embraces some new and advantageous features. The frame, including the arm supports, is one solid casting, and designed to resist with safety all strains to which it may be subjected. The cylindrical arm is placed 12 inches above the spindle center; for large machines it is 5½ inches diameter. Its bearing extends throughout the whole width of frame, and the arm has a large range of adjustment. The pendant is loose, and is also adjustable, so that it may be dropped inside of the work, where it cannot be swung in. The back gears lie entirely inside of the frame, and are out of the way.

The main spindle is large in proportion; it runs in double-tapered steel bushings, hardened and ground to fit, and provided with means for taking up at both ends of the bearings. The end of the main spindle is not only bored out tapered, but it is threaded, and has a ¼ inch collar turned out of the solid spindle stock against which the cap screw arbor shoulders, giving the tool exceptional cutting capacity and strength. The cap arbor is shown in the figure, indicating its comparative size.

The knee is gibbed square to the frame; its wearing surface is large, and means are provided for taking up on both edges. At the center of its weight it is supported by a 2 inch screw, which is stationary in the frame, thereby avoiding the necessity of cutting a hole in the floor. The elevating adjusting screw is at the top of the knee, geared 20 to 1 by double gearing, making the adjustment, as well as the up and down feed, extremely sensitive and easy.

The platen has three large T-grooves, which are open at the ends, without any overhanging parts. The capacity of the platen is comparatively large. The feed is exceptionally strong; it is taken directly from the end of the main spindle by a worm running in oil, and transmitted through patented universal joints.

Fig. 2 shows the circular milling attachment in working position, and clearly indicates the simple manner of transferring the feed motion from the platen to the attachment, whereby all the changes of feed of the machine can be given to the attachment, which can also be fed either automatically or by hand.

The attachment is adapted to take two pieces of work, one at either end. Any circular work, such as gear blanks, spur or bevel wheels, grooved pulleys, etc., from the smallest diameter up to 16 inches, can be milled to a finish two at a time, thereby obtaining exact duplicates, which is frequently a great advantage. It is claimed that in a given time a greater amount of duplicate work can be turned out with this attachment than with any engine lathe.

For irregular work, such as cams, etc., the same attachment is used with a sliding base. The former roll is held by a bracket from the base, and the arm and pendant hold it from the top. The spring on short turns, frequently found in cam cutting machines, is here claimed to be impossible, and consequently true work is obtained.

The States Machine Co. manufacture five styles of these machines, including full universal machines with back gears, and plain milling machines without back gears, but all are designed to do straight, circular and irregular milling.

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Steam Engineering.

In steam engineering, that is, in the construction of steam engines, more mistakes have, probably, been made by men bright in general engineering matters than in any other branch of engineering. Thousands of steam engines have been made that have proven failures because their originators have failed to profit by the experience of others. Something that looked immaterial has been omitted and practical failure has resulted.

In respect to the Corliss engine these failures have been rare, because that great engineer has been so closely copied. His invention related to important innovations, and the efforts at improvement have been in minor particulars, the main principle always being in view. And it was the employment of that principle that made the success of the Corliss engine.

The reason, as it appears to us, why so many failures have been made, is because of the lack of definite knowledge pertaining to the science of steam engineering.

For example, it was for a long time a disputed point as to the economy of compounding condensing engines, and there is even today a dispute amongst engineers as to the cause of this economy. This we have previously referred to, we believe. The point is that if there had been exact knowledge on the essential point there would not have been, and would not now be difference in opinion on the subject.

The more common opinion is that the gain in compounding condensing engines is due to less cylinder condensation, but we do not know much, only in a general way, about cylinder condensation. When it comes to the transfer of heat as between two bodies of unequal temperature, there is difference of opinion, and so on all the way through, there is this lack of definite knowledge that would apply to steam engine construction.

The knowledge necessary to reduce steam engine construction to as near a science as is practicable can undoubtedly be had, but only through costly and delicate experiments. Isolated experiments, such as we get from time to time, however valuable they may be, can never be patched together in a way to build up a science. Conditions always differ, and lack of knowledge of the influences of these variations in conditions always stands in the way. To establish a science there must be no speculation in the matter. Nothing but hard facts will answer.

While expressing no opinion as to the relative merits of high and low-speed engines, it is safe to say that the figures used some years ago in the discussion of the subject, pro and con, were, at the best, delusive. What seemed to be proved by figures appeared to be disproved by practice, leaving the question as unsettled as ever.

The various questions in steam engineering, as intimated, must be settled otherwise than individually. They must be settled by some competent body, like the American Society of Mechanical Engineers. Perhaps the undertaking is one too large for this society to undertake at present, but some time it will come in contact with it.

An International Brotherhood.

No question which has been discussed in our columns for a long time seems to have called out more views than that which was presented by Prof. Sweet, and in which he designed to show—not that we had not done anything here that was particularly creditable to us, as some of his critics seem to have assumed, but merely that we were too apt to overlook what others had done, and to be a little too much inclined to magnify our own achievements.

And among all the letters we have received on this subject from both sides of the water, we must say that we like the spirit of that by Mr. Frank Lester, which appears elsewhere in this issue, best.

It ought to be, and in fact is true, that engineers and mechanics of all countries are in a sense more closely bound together than are the different people of any one country. We entertain in this office engineers and mechanics from all parts of our own and other countries in which machinery is used, and we can testify that your genuine machinery mechanic and mechanical engineer is a royal good fellow, whether his home is in America, England, France, Germany, Italy or elsewhere, and we ought all to be more interested in the advance of the profession than in bickerings about which particular nation is ahead. When we hear of a new triumph of mechanical science in a European country, let us rejoice over the advance of engineering science rather than regret that our particular political division of the world cannot or does not monopolize all the glory.

The papers recently contained accounts of two fatal crossing accidents occurring on the same day—one in Cincinnati, the other in Orange, N. J., and in both of which street cars were struck by railway trains. According to the published accounts the flagmen failed in both these cases to do the duty assigned them, and for which they were employed, the one in Cincinnati mistakenly thinking the street car had plenty of time to get out of the way, and the one in Orange failing utterly to either think or do anything except to close the gates after the collision had taken place.

Probably nothing but the abolition of grade crossings will do away with such accidents, but in the meantime the devising and *adoption* of some automatic signal, by which a train would announce its approach to the flagman, and all others near a crossing, would, it seems, at least greatly lessen their frequency.

Another thing to be noticed is that in the case of the Orange accident, at least, it would have been avoided had not the horse drawing the car become terror-stricken, and refused to budge after drawing the car squarely upon the track. This is no new thing for a horse to do, and were it not for the fact that we are accustomed by long usage to the vagaries and uncontrollable panic of horses, the fact would be more generally recognized that travel by them is really more dangerous than by any other method yet devised by mankind.

All unfortunates who live within a mile of a great railroad yard or in the neighborhood of a great manufacturing center have reason to complain at the excruciating use to which the steam whistle is put in this country. There are whistles of all sorts and kinds which he may expect to hear from locomotives at least three times every minute all night. Then there are engineers who will contrive to wind up their efforts at whistling with an unearthly serpentine screech that is productive of the nightmare in the third degree. From about five o'clock in the morning the stationary engineer begins to get in his work. First his desire is to wake up the workmen—or perhaps their wives—then there is the call to breakfast and about two other calls before the wheels are started. All this whistling may be necessary, but we have doubts on the subject.

John A. Hill, one of the editors of *Locomotive Engineering*, has been doing up Europe in a trip extending through several weeks, and he felt constrained to write as follows of his observations of railroading in Germany: "There are about three times as many men around as you will find in America" Now, if the pay of the individual railroader in Germany is multiplied by three, it will probably be found that railroading costs just about as much there as here, and this will, we think, be found the case in the instance of many other industries, not only in Germany, but in all Europe. The American workman gets more pay per day and does more work. This is not true in all instances, but it is in the majority of cases.

One of the special desires of the inhabitants in most western cities, and in some eastern cities, is a smoke-preventing device for steam generators. Mechanics have expended much time and energy on the problem, but success has not kept pace with the efforts. Results have not been practically better in England, except that they have more mechanical stokers in use there than here. An English manufacturer, who had spent much time and money in experimenting, once told the writer that a good fireman was the best means of preventing smoke he had found, and that it was more satisfactory to him to pay an occasional fine than to trouble himself further with the devices brought out. But, of course, this is by no means conclusive as to the impracticability of preventing smoke, perhaps at some expense in coal consumption.

The Jersey City *Journal* says:

The procurement of a new water supply is about to become a fact, and it cannot occur too soon. An important feature, which the public is insisting upon, is that the whole matter be left open for competition. No single company owns all the water to be secured in this State, and all owners of water should have a full opportunity to submit bids. Jersey City wants the best water procurable, plenty of it, and at the lowest possible cost. It demands a supply independent of any other city. If the specifications ordered by the street and water board are drawn properly, there will be plenty of bidders, and that is what the city needs.

What Jersey City needs—like many another city—is good water. The cost of getting this will be manifested—about five times over—in less than a month in the increased value of property if the better supply comes.

Literary Notes.

STREET RAILWAYS: Their Construction, Operation and Maintenance. A Practical Handbook for Street Railway Men. By C. B. Fairchild, Editor of the *Street Railway Journal*.

This book treats on subjects relating to the transportation of urban and suburban dwellers quickly and cheaply. The work is not based on theory, but is the outcome of actual practice. It describes electric, steam, air and gas motors, and gives useful information and facts bearing on electric traction, cable traction, horse traction, track construction, discipline and rules, charter, franchises, stocks and bonds, bookkeeping and the classification of street railway accounts, and general information relating to the operation and maintenance of street railways. The first chapter will probably be the most interesting one to all who know nothing of, but wish to become familiar with the application of electricity as a means of transmitting power for propelling street cars, or to any one who wishes to become familiar with the construction of dynamos and the principles upon which they work. The subject in this chapter is treated in a remarkably plain and simple manner, and will enable the beginner to grasp the essential features of electric traction and lay a good foundation for subsequent studies. All the following chapters will be found reasonably complete regarding the special subjects treated. We believe that it can be safely said that this book will be valuable and interesting, not only to the novice, but also to the veteran, as it will remind the latter pleasantly of the steps by which he attained to his present eminence, and may also remind him of things which he should not have forgotten.

The book contains 426 papes of reading matter; the size of the pages is 9x11½ inches, and the price of the book is $4. It is published by the Street Railway Publishing Company, *World* Building, New York.

We have just received a copy of "Poor's Directory of Railway Officials and Manual of American Street Railways for 1892." It contains a list of the officers of all railroads in North America, and of the leading organizations auxiliary to the railroad system, and a list of officers of South American and Hawaiian railroads. An entirely new feature of the book is a directory of directors, which takes up about 110 pages. The statements of street railroads have been very much elaborated, and for most of the leading companies are now given in as much detail as the statements of steam railroads. The Manual also contains a complete list of all railroads projected or which are now under construction in the country, giving

important information to manufacturers or dealers in railway materials, as well as to the general public. The whole has been compiled from official information, and can be relied upon. This Manual is a great improvement upon any previous issue, and will be exceedingly useful to all interested in railroads, or those who have occasion to refer to it. The Manual is published by H. V. & H. W. Poor, 70 Wall street, New York. Price not given.

Mr. Edwin B. Frost contributes to the *Astronomische Nachrichten* his observations on the thermal absorption in the solar atmosphere, made at Potsdam under the direction of Prof. Vogel. Secchi, Langley, Cruls, and others have studied the effect of the sun's own atmosphere in absorbing the heat rays, but the results present very considerable discordances. Mr. Frost, aided by the resources of the Potsdam Observatory, constructed his apparatus himself—a thermopile so modified as to preclude systematic errors. His observations were made in September and October, 1891, and in March, April, and May, 1892, and the original paper must be referred to for the tabular statement of results. While earlier observers had found the heat radiated from the southern hemisphere of the sun to be only three-fourths that from the northern, Mr. Frost's work enables him to conclude that the heat transmitted from points in the neighborhood of the sun's poles is at present practically the same as that from points on the equator equally distant from the center of the disk, while the difference between northern and southern hemispheres, if real, is exceedingly small. Of heat radiation emitted from the sun and passing along its radius, about one-fourth part is absorbed in the sun's atmosphere; and the earth would receive from the sun, if the atmosphere of the latter were removed, 1.7 times the present amount.

Jersey City, N. J., is, probably, of all cities in the world the most completely dominated by railroads. Recently, when in the interests of health a sewer was needed, a railroad company defied the authorities in the matter of crossing their line, threatening to run down any one who was working on the proposed improvement. It is such things as this that intensify the popular outcry against railroads. When a road or two assume to own the town through which they pass, the people are inclined to inquire if they have any privileges.

The latest smuggling move in this country is one to smuggle in Chinamen. It is said to have its origin in Chicago. It probably appears a little strange to the promoters of this scheme that the United States, which has done the asylum act for the "oppressed" of all nations, should shut down, to a small extent, on the business; hence the attempt to beat the authorities.

Away back something more than forty years, the chief engineer of the fire department of Jersey City received $150 a year for his services. The firemen went on a strike to get his pay raised. The record shows that the firemen won.

A new system for ventilating passenger coaches is being tried by the Morris & Essex Railroad. A current of air is drawn through the dome windows, and passes out under the floor of the car.

The rafting of lumber on the western rivers is gradually giving way to carrying by railroads. Railroad transportation is said to be less dangerous, and more sure as to time.

It is proposed to erect an observatory at Niagara Falls which shall be 250 feet high. It is to be of steel. Four main columns are to constitute the framework of the structure.

Extensive preparations are being made for newspaper correspondents who will be present at the dedication of the World's Fair in Chicago next month.

QUESTIONS AND ANSWERS.

Questions of general interest relating to subjects discussed in our columns will receive attention in this department. The writer's name and address should always accompany the question. Neither correct initials nor location will be published when there is a request to that effect. If questions are enclosed with a business communication, they should be written on a separate sheet.

(432) A. M. C., Kingston, Canada, writes: Please give us the title of a reliable work treating on stove molding. *A.*—We do not know of any work treating on this subject.

(433) J. H. B., Findlay, Ohio, writes: I would like to ask if there is a United States Standard for keyways. If so, what is it? *A.*—There is no United States Standard for keyways.

(434) The president of the Amalgamated Molders asks: Is it true that in England the common practice in stove making is to cast the stove solid and then bore out the inside? *A.*—No.

(435) J. R., Huntington, W. Va., writes: Please give in your Question and Answer columns the capacity of a tank in gallons for a switching engine, as per sketch. *A.*—About 633 gallons.

(436) A. B., Walden, N. Y., writes: Please inform me through your paper of the volumes and numbers in which articles treating on tool chests have appeared. *A.*—April 16, May 7, 14, 28, June 11 and July 2, 1891.

(437) E. G. J., Camden, N. J., writes: Please inform me how much a square foot of aluminum $\frac{3}{32}$ of an inch will weigh. I make it 1.0501 pound. *A.*—Your weight is rather light; it should be 1.21 pound. 2. Can this metal be cut with shears? *A.*—Yes.

(438) J. D., Cleveland, O., writes: Please answer through your columns whether there is any such thing made as cold-drawn or cold-rolled iron or machinery steel $\frac{5}{16} \times 1\frac{7}{8}$ inch and $\frac{5}{16} \times \frac{5}{8}$ inch. If such is made you will confer a great favor if you will let me know where it is made. *A.*—Write to Messrs. Jones & Laughlins, Pittsburgh, Pa.

(439) M. I. W., Charlotte, N. C., asks: Can you kindly recommend us a book suited to put in the shops for the use of apprentices—something that tells at what speed to cut metals, make calculations for cutting a screw, and one which gives general shop information? *A.*—Modern Machine Shop Practice, by Joshua Rose, may answer your purpose.

(440) J. L. T., Chicago, Ill., writes: I am building an engine with cylinder 2 by $2\frac{1}{2}$ inches; revolutions per minute, 500; steam pressure, 200 pounds; cut-off at half stroke Please give its power. *A.*—About 3 indicated horse-power. 2. Will the engine be large enough to drive a boat 16 feet long, $2\frac{1}{2}$ feet beam and 14 inches draught, carrying three persons? *A.*—Yes; amply large enough.

(441) G. S. B., San Francisco, Cal., writes: In your issue of September 15 you say the *Journal of Naval Engineers* for August should be in the hands of all engineers. This suggests to my mind that it may be possible to secure a copy if I only knew where to apply. If you can direct me how and where to secure a copy you will greatly oblige. *A.*—Write to the American Society of Naval Engineers, Washington, D. C.

(442) A. D. M., Monmouth, Ill., asks: Will a $3\frac{1}{2}$-inch pipe flattened to $\frac{1}{2}$ inch, and to whatever width it will take, give the same result, either in efficiency or economy in heating at a low pressure, say 2 or 3 pounds, as it will when round? If any difference, please explain, and why. *A.*—A round pipe of suitable size for the space it has to heat will be more efficient, because when round it will have a greater cross-sectional area than when flattened, and therefore the flow of the required amount of steam will not be checked, as will occur when the cross-sectional area is reduced by flattening. The economy will also be increased by using the round pipe, because less weight of pipe will answer the purpose than is required with a flattened pipe. The truth of these statements will be apparent when it is remembered that by flattening the pipe, so as to close up the inner area, the pipe will be of no use, and will have neither efficiency nor economy.

(443) L. F. A., Phenix, R. I., writes: Please give the force with which a weight of 300 pounds, free to fall through a distance of 8 feet, will strike a body. Also give the way of computing the force. *A.*—The force with which a weight will strike a body depends on one of two conditions; first, it may depend on the distance through which the weight moves during contact with the body; or, second, it may depend on the time of contact. Suppose that, according to the first condition, the weight moves through 1 inch from the time it touches the body up to the time it comes to rest. In this case we must find the stored up energy in the weight after it has fallen 8 feet. This is numerically equal to $\frac{W v^2}{64.4}$, in which W denotes the weight of the body in pounds, and v the velocity in feet per second of the weight when it has fallen 8 feet; the square of this velocity is found by multiplying the height through which the weight has fallen by 64.4, hence the square of the velocity is equal to $8 \times 64.4 = 515.2$, and therefore, according to the formula $\frac{W v^2}{64.4}$, we have for the stored up energy $\frac{300 \times 515.2}{64.4} = 2{,}400$ foot-pounds. The weight cannot come to rest until the whole of this energy has been expended, and if the weight moves through 1 inch $= \frac{1}{12}$ of a foot before it comes to rest, the average force with which the weight strikes the body must be equal to $2{,}400 \div \frac{1}{12} = 28.800$ pounds. If we take time of contact into account according to the second condition, then we find the average force by the following formula:

$$f = \frac{W v}{32.2\, t} \qquad (2)$$

in which f denotes the average force in pounds; v, the velocity in feet per second the weight has attained at the end of the fall of 8 feet, and t the time in seconds. We have already found the square of the velocity to be 515 2, hence the velocity v is equal to the square root of 515.2, which is 22.7 feet per second (very nearly). At the be inning of the contact the velocity is 22.7 feet and at the end of contact it is 0; hence the average velocity during contact is $\frac{22.7}{2} = 11.35$ feet per second, and if the weight during contact moves through a distance of 1 inch $= \frac{1}{12}$ of a foot, the time of contact will be $\frac{1}{12} \div 11\ 35 = \frac{1}{11.35}$ of a second. Substituting these values for the symbols in formula (2) we have

$$\frac{300}{32.2} \times \frac{22\ 7}{\frac{1}{136.2}} = 28{,}800 \text{ pounds},$$

which is practically equal to the first result.

(444) H. W., Oswego, N. Y., writes: Kindly give me the following information: How is the hectograph made, and what proportions are used in making the same? I have great need for the use of one, and would feel thankful if you would answer me through the columns of the AMERICAN MACHINIST. *A.*—In general terms the hectograph consists of a tray filled with a jelly-like composition. Any imprint made upon the surface with aniline ink can be transferred to paper by simple pressure. The tray filled with composition is called the tablet. It is thus prepared: The tray may be made of tin, or even pasteboard or paper, and should be about one-half an inch deep. It may be made of any length and width, according to the work it is to do. The composition is made from the best gelatine and glycerine. One ounce by weight of gelatine is soaked over night in cold water, and in the morning the water is poured off, leaving the swelled gelatine. Six and one-half fluid ounces of glycerine are now heated to about 200 degrees Fah., on a water bath preferably, and the gelatine is added thereto. The heating is continued for several hours. This operates to expel the water and to give a clear glycerine solution of gelatine. The composition is then poured into a tray which must be perfectly level in order to obtain a surface nearly even with the edges. It is then covered so as to keep off the dust. The cover, of course, must not come in contact with the smooth surface. In six hours it will be ready for use. The original copy that is to be reproduced is made upon ordinary paper with aniline ink. One formula for the ink reads as follows: Aniline violet or blue (2 R. B. or 3 B.), 1 oz.; hot water, 7 oz.; dissolve. After cooling add alcohol, 1 fluid oz., and glycerine, $\frac{1}{4}$ fluid oz., a few drops of ether and a drop of carbolic acid. Keep in a corked bottle. The writing is executed with an ordinary steel pen. The lines should be rather heavy, so as to show a greenish color by reflected light. The surface of the pad is slightly moistened with a wet sponge and is allowed to become nearly dry. The paper is then laid upon it and smoothed down. This is best done by placing a second sheet over it and rubbing this by the hand. No air bubbles must remain between the copy and the tablet, and the paper must not be shifted. It is allowed to remain for a minute or less, and is then raised by one corner and stripped from the gelatine surface. It will have left the reversed copy of its inscription perfectly reproduced upon the tablet. At once a piece of ordinary writing paper is laid upon the tablet, smoothed down and stripped off, when it will be found to have taken with it a complete copy of the inscription or writing. This is repeated over and over again with another sheet of paper until the ink on the pad is exhausted. Fifty or more good copies can be thus obtained. As soon as the work is completed the remains of the ink should be washed off with a moist sponge, and the tablet, after drying a little, will be ready for a second operation. Some practice is required to ascertain the proper strength of the writing and degree of wetness of the surface. When the gelatine surface becomes impaired it can be remelted in a water bath if it is not too dark from absorption of ink. The above has been taken from the little book entitled "Rubber Hand Stamps and the Manipulation of Rubber," by T. O'Conor Sloane, A. M., E. M., Ph. D., in which other receipts for the above process are given, besides much useful information relating to other matter.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

An odontograph for next to nothing on page 20.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

Forming Lathes, Mer. Mach. Tool Co., Meriden, Ct.

Ideal Drawing Stands. M. C. Hammett, Troy, N.Y.

A. D. Pentz, Consulting. Tools. Elizabeth, N. J.

Tool Holder: Armstrong Bros. Tool Co., Chicago. New lists of cutters. Brown & Sharpe.

"Bradley's Power Hammers, the best in the world." 20 sizes. Bradley & Co., Syracuse, N. Y.

"The Bulldozer," a new departure: forging by pressure. M'f'd by Williams, White & Co., Moline, Ill.

Pattern and Brand Letters. A variety of sizes and styles. Heber Wells, 8 Spruce St., New York.

Davis Key-Seating Machines kept in stock by Manning, Maxwell & Moore, 111 Liberty St., N. Y.

Selden Packing for stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt St., N.Y.

S. A. Smith, 23 S. Canal St., Chicago, Ill., is agent for Standard Tool Co.'s Twist Drills.

Pulley lathes, most efficient offered. The Lodge & Shipley Machine Tool Co., Cincinnati, O.

J. S. Thurman, M. E., Indianapolis, Ind., Expert Patent Solicitor. Inventions Perfected.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocum & Son's Shafting Works, Drinker St., Philadelphia, Pa.

For best Return Steam Traps, Pressure Regulators, Positive-Acting Pump Govs., Back-Pressure Valves, T. Kieley, 11 W. 13th St., N. Y. Send for des'n.

For the Latest Improved Diamond Prospecting Drill, address the M. C Bullock Mfg Co., cor. Canal and Washington Sts., Chicago, Ill.

Patterson, Gottfried & Hunter, Limited, 146-150 Centre st., New York, are putting on the market a new alarm speed indicator. Send for circulars.

25" 32" 37" 42" "Only Drill Press built on 'Ko-rekt' principles, Even if they come from Jersey." Gould & Eberhardt, New Ark, N. J.

S. W. Card & Co., Mansfield, Mass., are putting on the market a new line of stocks and dies, with their patent adjustable dies and guide. S. A. Smith, 23 S. Canal Street, Chicago, Ill., Western Agent.

Patent Soliciting of High Class.
D. Walter Brown, Counsel in Patent Cases,
31 Nassau Street, New York.
Send for Brief History of Patent Legislation.

De Lamater Screw Propeller Wheel, made only by The Samuel L. Moore & Sons Co., Elizabethport, N. J., who have purchased from C. H. De Lamater & Co., New York, all their patterns, books of record, gauges, etc. Location and equipment well adapted for Heavy Steamship Repairs.

"Binders" for the AMERICAN MACHINIST. Two styles—the "Common Sense," as heretofore sold by us, and mailed to any address at $1.00 each, and the "New Handy," mailed at 50c. each. The former has stiff board covers, while the latter has flexible covers with full page opening flat. Either will hold the entire 52 issues of any volume. AMERICAN MACHINIST PUBLISHING CO., 203 Broadway, New York.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway Contains plain directions for using the indicator and making all required calculations from the diagram, also the principles of economy in operating steam engines and current practice in testing engines and boilers. Price, $2 postpaid. Published by John Wiley & Sons, 53 East Tenth Street, New York.

Horizontal Tubular Boilers.

BY T. T. PARKER.

At present, the drift of buyers and builders is toward the flush front setting. This style is also more popular with engineers and firemen, largely because of the lesser liability of sudden development of new cranial lumps caused by contact with overhanging front. Then the flush front, with its upper doors embellished with a flying eagle, a star-spangled banner, or perhaps a lion's head, add to beauty of the scenery, and some think enable the boiler to evaporate more water per pound of coal.

It was considered good practice with the overhanging front to put in the front head with the flange out. Many claim this manner best, on account of stiffness near the flange, while others did not like it, because of the corrosion caused by leaks at manhead.

With the flush front, now so common,

builders are about equally divided regarding putting in the front head, *i. e.*, flanged in or out. I believe it to be the best practice to flange this head in, and for these reasons: Any leakage at man head will then run quickly away, and not lay in the flange.

Then with a flanged out head and flush front there is almost sure to be overheating of the head seam. The distance from the door to the head varies with builders, ranging from 20″ to 34″ on a 66″ head. With even the lesser amount, and assuming the brick work in good order, the heat at this point is surely too great for a seam unprotected by water. Should the boiler be worked hard the heat will burn away the lower sheet at the seam. The brick-work at this point is very apt to be out of order, as it is almost impossible to make and keep it fitting snugly up to the boiler. But when the brick-work is down and neglected, then the heat gets in its work on the flanged out-seam. One case coming under my observation having been set up without any brick-work at this point, in six months' time required 48 new rivets to keep peace in the family and water in the boiler. In other cases new heads, sheets and patches have been the direct effect of this way of putting in the head. Of course, all this was job work for the fraternity, but as the owners have the bill to pay and now know the value of the two methods, they may insist on other ideas in future. If you are filling out specifications for the new boilers make a note of this, and you won't be bothered by repairs in this direction, and the engineer will have the worry of watching that brick-work taken away.

Paper Matches.

A new match is on the *tapis* at Jonkoping, the invention of a Swedish engineer, Fredriksson by name, who has been experimenting for several years for the purpose of simplifying the manufacture of matches. The idea in his match somewhat reminds one of the rolled-up tape-measure of a tailor encased in a metal cover, and with only the end projecting. There is a metal cover, in which is placed a roll of paraffined paper, intercepted at regular intervals so that small points are formed. On these the igniting substance is placed. An end of the paper projects from out of the casing, and on pulling it quickly out, the substance is ignited against the small steel plate, and one has a match which burns slowly and evenly. The metal cover can, of course, be varied in accordance with the different requirements of its use, and when the paper roll is finished a new one is inserted. It is claimed for this new kind of match that it simplifies the manufacture to a very considerable degree, 20 men and 80 boys being able to make 1,000,000 matches per hour.—*London Industries.*

The Mexican Rurales.

An American traveling in Mexico cannot fail to be impressed by the splendidly mounted and equipped bands of cavalry guards that dash up to the railroad depots and stations whenever a mail train arrives. These are the famous Rurales, the flower of the Mexican army, to whom General Porfirio Diaz, the president, has trusted the railroads and border customs as a special favor. And right proud and jealous are they of the trust. Their vocation is to guard the customs on the borders, and to protect the railways and trains from robbers and wreckers; and so well have they done their duty that no money could tempt the most foolhardy bandit to interfere with the railroads.

They are a class of men eminently adapted to their calling, combining something of the cowboy of the plains, something of the trooper inured to hardships, and a good deal of the dash and splendor of ornamental soldiers. They ride like demons on fiery horses, fight like tigers, and coolly smoke cigarettes in the face of death. All that is their business, and they fairly revel in it.

When they had train robbers to hunt, it is asserted on authority from the City of Mexico, they never turned and fled. Nor did they ever let the robbers slip through their fingers.

A band of three or more is ever ready when the train stops. Should the conductor or engineer report any interference with the train, these soldiers are away at once in quest of the offenders. Quite often they ride on trains as a guard, so that traveling is done in safety south of the Rio Grande.

Mexico is exceedingly strict in dealing with bandits who meddle with the railroads. The penalty has been told. But so strict is this law it seems harsh, or, in fact, arbitrary. Even the most insignificant act that would injure a railway bed assures the same punishment. To remove a single spike, to chip off a splinter from a tie, is punishable by the fusillade of Rurales bullets as much as a desperate attempt at wrecking a train is; for, small as they seem, it is still a matter for engineers, not laymen, to determine whether such acts would not derail a fast-running train.—*San Francisco Examiner.*

The Pattern Maker.

No one has ever sung pæans to the pattern maker. We are all ready to offer praise to the skill of the machinist who fashions metals to exact forms, and brings things together just as they should come together, but who ever says anything about the pattern makers' art?

There is a popular delusion that the pattern maker has only to use a "shrink rule" in measuring his work, and that working by that he comes out all right. This is the biggest fallacy in the world. The skilled pattern maker uses his shrink rule just as some great painter—we forget who—mixed his paints, viz., with brains. He knows how different castings will shrink, and governs himself according to the knowledge that has come from experience.

Then, again, in different shops the pattern maker has different classes of molders to deal with, and he must study their peculiarities in order to know how his work will come out of the sand.

Altogether, the conscientious pattern maker has a responsibility on his shoulders that gets away beyond measuring to the thousandths of an inch. He must measure to the extent of probabilities that are to be accounted for. He is one of the kings amongst workmen. In almost all metal construction he comes to the front. If he does not get justice in words, it comes to him in deeds.

A New Record to New Orleans.

The new Morgan Line freight steamer *El Norte* arrived late last evening at New Orleans on her maiden voyage from this city, beating all records between the two ports. The *El Norte* sailed at three o'clock last Saturday afternoon for New Orleans and arrived at her wharf at Algiers at 6.15 o'clock last night. The time of her run from Sandy Hook to the South Pass, where the ocean voyage ends at New Orleans, was made in the remarkably short time of four days, sixteen hours and thirty-five minutes, being the best run by five and one-half hours ever made between the two ports. The best previous record was made by the new steamer *El Sol*, of the same line. After clearing the Pass the *El Norte* headed for her dock, 100 miles away. This run was made in five hours and fifty-five minutes. She left this port with a full cargo on board, and when unloaded and loaded on cars for further shipment it will fill two and one-half miles of cars. The *El Norte* is expected to lower the record on the up trip on her return.—*Evening Post*, Sept. 30.

Very early in the present campaign we advised our readers who are interested in machine shops and other industrial establishments to keep their politics and their shops as distinctly separated as possible, and to confine their political action to their conceived duties as citizens entirely outside of their relations as employers and employes. We are gratified to know that this suggestion is being acted upon to a large extent, and we are hearing far less in this campaign than we usually do of shops that have been converted into campaign clubs.

We are furthermore gratified to know that not only shop men, but all other men, are apparently taking their politics more calmly this year than usual, and that we are seeing less of the senseless "demonstrations," torch-light processions, etc., than usual. The party that can get up the biggest "demonstration" or find the most men willing to wear gay colored oil cloth capes and carry torches in a procession is not necessarily the best party, nor is it necessarily contending for the best political principles. In other words, such things prove just nothing at all, and it is much more creditable to us as a people that our campaigns should be carried on chiefly by mental rather than by spectacular processes.

Space at the World's Fair.

We suppose that those who have the allotment of space at the World's Fair are doing the best they can, but it must be admitted that the course they pursue, as we have previously intimated, has brought about a very general sense of dissatisfaction that can hardly fail to injure the enterprise. But then the people of this country are not much accustomed to running world's fairs, and mistakes are likely to occur. A blunder is hardly a crime, although closely allied to it.

It seems to be a fact that prospective exhibitors cannot find what space they can have, or, in fact, that they can have any space. A little more energy on the part of the managers would, probably, produce better results. Matters in respect to the allotment of space are away behind the usual practice in the case of world's fairs.

Next Meeting of Mining Engineers.

We learn from the secretary that the next meeting of Mining Engineers will be held at Reading, Pa., headquarters being at the Neversink Mountain Hotel.

Professor Todd, of Amherst College, after mentioning the fact that astronomical science demands more large telescopes, says:

"But somebody will have to put up the money for the 'great big' telescope very soon, or there may be no one to make it. The senior Clark is dead, his elder son is dead, and the younger is 55 to 60 years old. If he could get the necessary glass disks, he would take a contract to make a four-foot or five-foot telescope in two or three years, probably for $125,000 to $160,000. Of course, we have good opticians left if he dies, but they have not yet had a chance to prove their success in building a big telescope, as he has."

The Clarks have been famous builders of large telescopes, but a greater than they will rise up after them.

From the New York office of the Crescent Steel Works has been issued a card, upon which the sizes of all Crescent special steel drill rods are given in parallel colums, showing the gauge numbers and letters, the exact sizes in decimal parts of an inch, and the nearest size in ordinary divisions of an inch. No tool maker or other mechanic who uses these rods will need to be told of the convenience of such a card for use in the shop, and one should be in every shop where these rods are used.

It looks as if it would be a comparatively simple matter to determine the relative economy as between a simple and a compound locomotive if an entirely unprejudiced test were undertaken. But it seems to be a hard matter. It is a matter that is being pretty thoroughly discussed, and impossible "indicator" diagrams are shown from both classes of engines. An honest trial, made without favor, would show the whole matter in its true light.

The Jersey City Board of Water Commissioners has directed Chief Engineer Ruggles to prepare specifications for a new supply of wholesome water. It is a little late to do this, but better late than never.

MANUFACTURES

The Brown-Bonnell Iron Company, of Youngstown, O., have completed plans for the erection of a girder and bar-mill, that will be furnished with all the latest improvements.

Messrs. S. W. Bates, of Portland, Me., S. R. P. Pingree, of Auburn, Me., and another gentleman have formed a company for the manufacture of a new kind of covering for steam pipes.

Charters were recently granted to the Industry Down and Quilting Company, at Lansdowne, Pa., capital $5,000, and the Hanover and McSherrystown Street Railway Company, capital $30 000.

The Leland, Faulconer & Norton Company, of Detroit, Mich., are putting up a new plant, consisting of a three-story main building, 158x53 feet in size, and an engine and boiler house, 68x31 feet.

The Portland & Rumford Falls Railway have advertised for the construction of the extension of their road from Mechanic Falls, Me., to the Maine Central, at some point between Danville Junction and Auburn.

The following articles of incorporation were filed in the office of the Secretary of State of Ohio: The Co-operative Foundry and Machine Co., Sandusky, O., capital stock $10,000; the Toledo Electric Co., Toledo, O., increase of capital stock from $200,000 to $400,000.

The Mason Regulator Company, Boston, Mass., issue a leaf upon which is shown the world, as it was supposed to be, previous to the discovery of America by Columbus. It is shown, rather conclusively, that nothing was then known about the Mason Regulator.

The U. S. Cold Wire Rolling Co. will begin building their mill at Hammond, Ind., very shortly. The company will manufacture cold-rolled copper wire by a process invented by Henry Williams, of Boston. It is stated that the company has large contracts with the Bell Telephone Company.

The Builders Iron Foundry, of Providence, R. I., has recently shipped for test at Sandy Hook the first of the eight 12 inch mortar carriages for which they have a contract with the United States government. These carriages are large and powerful pieces of mechanism, and are to be used for coast defense. The total weight of each is about forty-two (42) tons.

The Plainfield (N. J.) Common Council recently adopted on final passage an ordinance granting the Plainfield Electric Street Railway Company the privilege of extending its tracks through East Front and Peace streets to North avenue. The North Plainfield Borough Council will now give the company a franchise to extend the railway into the borough through Somerset street from Front street to the foot of the Watchung Mountains.

The Field Feed-water Purifier Co. within the last month has equipped the new plants of the Armour Packing Co. and the National Linseed Oil Co., at Kansas City, also the new Electric Light and Power Co. plant at Rockford, Ill., and has filled orders for the Chicago & Alton Railroad. The Wisconsin Central, since the beginning of the year, has equipped twelve locomotives. Several of these purifiers have been supplied for marine boilers.

New water-works for Greenville, Me., are now among the early possibilities, as the town is especially well located for obtaining a complete service at less money than it usually costs for that work. The Sawyer Pond, two miles distant, is found to be 222 feet above the level of the lake, and Engineer Maxey estimates the cost of bringing this water to all parts of the village at $20,000. The supply will be perfect for not only drinking, but fire purposes.

The Superior Steel Company, Pittsburgh, Pa., is building a mill at Mansfield, Pa., for the production of cold rolled steel. The mill building proper is of iron, 120x180 feet, with slate roof. At present the company is putting in four 6-inch and two 10-inch mills, and is making plans for two 12-inch mills. The product of the plant will be cold rolled strip steel and strips for tin-plate. This latter will be made in long narrow sheets to be used by makers of baking powder and other cans, the sheets being made the same in width as the cans are in height.

E. C. Fairbank, of Bellows Falls, who lately bought the old factory property of the J. L. Butterfield estate, and who has been spending a week looking about for machinery, began work Wednesday, and will put in at once a grist-mill, and, perhaps, a saw-mill and chair shop. We are glad to have so worthy a man as Mr. Fairbank begin business here, and as he wants to do all he can to benefit the place, we wish him success in business. Mr. Butterfield began repairs on the building, intending to use it in his soapstone business, but died before the work was finished.—*Vermont Phœnix.*

There is water-works agitation at Lawrence, Mass.; Houston, Tex.; Christianburg, Va.; Vancouver, B. C.; Amboy, Ill.; Philadelphia, Pa.; Pittsburgh, Pa.; Galveston, Tex.; Guthrie, Okla.; Casper, Wyo.; Fort Meyer, Va.; Rico, Cal.; Summit, N. J.; Wilmington, Del.; Amherst, Mass.; Babylon, L. I.; Farmer City, Ore.; Harrisburg, Pa.; Pittsford, Vt.; Woodstock, Ont.; American Fork, Utah; Beaver City, Neb.; Ellensburg, Wash.; Umatilla, Ore.; Summerland, Wash.; Allegheny, Pa.; Millbury, Mass.; Wickford, R. I.; La Grange, Ind.; Wheaton, Ill.; Pembroke, Ont.; Montpelier, Idaho; Bangor, Me.; Fargo, Dak.

Mackintosh, Hemphill & Co., Limited, of Pittsburgh, Pa., are building for the National Tube Works Company's Bessemer steel plant a 36-inch blooming-mill, equipped with tables and manipulator, a hydraulic shear capable of cutting 8x8-inch blooms, or slabs of equal section, with tables complete for same; geared shears for cutting billets and blooms, also with tables complete, and a pair of condensing tandem compound Bessemer blast engines, coupled at right angles; size of blast cylinder, 54x60 inches.

A certificate of the incorporation of the Charles Horn Silk Company was recorded recently at the New Jersey County Clerk's office. The capital stock is $100,000, divided into 1,000 shares of $100 each. Charles Horn, of New York, holds 998 shares; Peter Ryle, of Paterson, N. J., one share, and August Steinbuchler, of Brooklyn, one. The factory is in New York, the certificate of incorporation being made under the laws of New Jersey merely because they are more favorable than those of the other State. A certificate of the incorporation of the Golden Rod Silk Company was also recorded at the N. J. County Clerk's office. Its capital stock is $50,000, divided into 500 shares of $100 each, and the amount paid in is $10,000, of which Walter H. Graef, of New York, has ninety-eight shares; Emil Marcus, of New York, one share, and Joseph G. Browning, Jr., of Brooklyn, one. The company is also a New York concern, engaged in the manufacture of broad silks.

Skowhegan, Me., is gratified at the announcement that the Leland Tanning Company of that place, who had been contemplating a removal to Portland, will remain there and enlarge their business. The company have leased for a term of six years the buildings they have occupied, and will make extensive repairs and improvements, with the view of increasing their output from 300 sides a month to 900. The company started two years ago to manufacture belting, strap and picker leather, with a capacity of 50 sides a month. The process used is a new one in the tanning business, the secret of which is known only to Mr. A. H. Noyes, and it gives the leather, so experts say, more strength and durability than any other now on the market. The growth of the business has demonstrated that the new leather is a success, and the capital stock of the company will be increased some $20,000, and the product of the plant pushed on the market for all it is worth.

The stockholders of the Keating Wheel Company, of Holyoke, Conn., met at Portland, Me., Saturday, and elected a new set of directors and officers. The capital stock was increased from $200,000 to $250,000, and it is expected that all the additional stock will be taken by Holyoke men, as most of it has been spoken for. The new directors will be H. M. Farr, George L. Bosworth, R. M. Keating, W. T. Dean and A. W. Esleeck. The officers organized as follows: President, H. M. Farr; vice-president, R. M. Keating; treasurer, George L. Bosworth. The concern will have Mr. Keating as local manager, and he will have entire charge of the shop work. The increased capital will be used in getting out next season's wheel, and men are already at work on the machine. A larger force of men will be kept at work during the winter, and the prospects for the wheel are brighter than ever.

Machinists' Supplies and Iron.

NEW YORK, October 8, 1892.

Iron—American Pig—We quote Standard Northern brands, No. 1 Foundry, $15 to $15.50; No. 2, $14 to $14.50; Gray Forge, $13 to $14. Southern brands of good quality are obtainable at $15 to $15.50 for No. 1 Foundry; $13.50 to $14 for No. 2; and $12.25 to $13 for Gray Forge.

Scotch Pig—Coltness is quoted at $21; and $20.25 for Eglington.

Antimony—The market is steady. We quote L.X., 10¾c. to 10¾c.; Cookson's, 11c. to 11¼c.; Hallett's, 10c. to 10½c.

Copper—The market is quiet. Several lots of Lake Copper have changed hands at 11¼c. Casting Copper is held at 10¾c. to 10¾c.

Lead—The market has unexpectedly declined. About 200 tons have sold at 3 95c. to 4.02½c., and more can be had at the same figures. Car lots are quoted at 4.05c.

Lard Oil—Prime City is quoted at 62c. to 63c.; Western on spot at 61c.

Spelter—The market is unsteady. It is reported that 4.40c. would doubtless buy, but the store price is 4.50c. to 4.60c.

Tin—The market is firm, with 20.55c. asked for spot.

WANTED

"Situation and Help" Advertisements only inserted under this head. Rate 30 cents a line for each insertion. Seven words make a line, and the address as desired to appear should be included. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Wanted—Situation by experienced draftsman designer. Address BOX 4, AMERICAN MACHINIST.

General machinist and die maker wants position. Address BOX 10, AMERICAN MACHINIST.

Tool maker wishes engagement; skillful workman on spec'l tool & auto. mach.; capable of taking charge tool room; long exp.; best ref. Box 8, A M.

Wanted—Ass't pattern foreman for architectural iron work. A fine opening for an ambitious young man. The Snead & Co. Iron Works, Louisville, Ky.

Wanted—Metal pattern maker on patterns for iron pipe fittings and valves. Apply to the Kelly & Jones Co., Greensburg, Pa.

Wanted—Three planer hands, 3 lathe hands, and 2 floor hands, all first-class men. Sioux City Engine Works, Sioux City, Iowa.

Wanted—For a few months, a competent mechanical draftsman on construction work. George D. Dutton, Springfield, Mass.

Situation Wanted—Pattern maker 25 years exp.; 10 years as leading hand on loam and dry sand with Harland & Wolff, builders of White Star Line. BOX 7, AMERICAN MACHINIST.

A mechanical engineer with 15 years' experience and office in New York desires the agency of some first-class manufacturer on reasonable terms. Address A., Box 1187, N. Y.

Wanted—Mech. draftsman, with exp. in mine and pumping machinery. Address, with full particulars as to exp., age, etc., to Jeanesville Iron Works, Jeanesville, Luzerne Co., Pa.

Wanted—To take charge of refrigerating ice plant in small city or town, or employment as machinist, the object being to have a permanent home; best references. Box 2, AM. MACHINIST.

Wanted—Position as foreman machinist by a first-class man; industrious, sober and honest; 17 years' experience in marine, stationary and pumping machinery. Address C. W., AMER. MACHINIST.

Wanted—A draftsman to take charge of a drawing room; must have a thorough technical training, be a good designer, accustomed to handle men, and get work out quickly; a permanent position to right man; state reference, age, and salary expected. Address Box 9, AMERICAN MACHINIST.

Wanted—A man capable of sup'tding a moderate sized agricultural mach'y plant; must possess exec. ability, intelligence, with a thor. knowledge of gen. mach'y; without these qualifications don't apply; unquest'd ref's required; state past exp. Improvement, S 28, care Lord & Thomas, Chicago, Ill.

Wanted—A superintendent of foundry in Ohio, 4 tons daily capacity, great variety of moderately heavy castings. About 30 men employed. He must be a 1st class molder and good manager of men, a man of family, industrious and strictly temperate. Address B. B., AMERICAN MACHINIST.

Wanted—An experienced foreman in the machine shops of this company; a man thoroughly up in modern shop practice and accustomed to fine work required. Address, stat'g full part'c's & pay exp'd, with refs.; also good mach's wanted. Lanston Monotype Mach. Co., 801 Market Space, Washington, D.C.

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INVESTIGATION IS CONVINCING.

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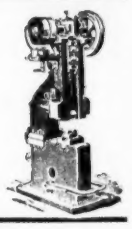

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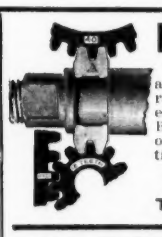

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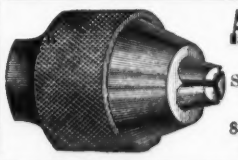

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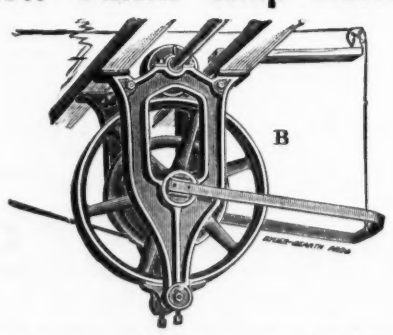

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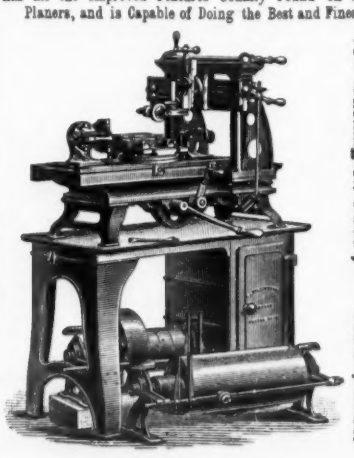

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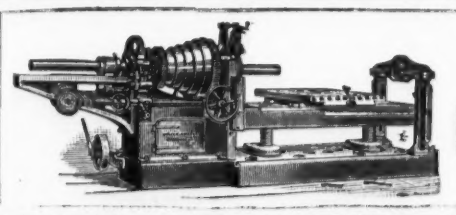

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✢ MISCELLANEOUS WANTS ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Cheap 2d-hd lathes & planers. S. M. York, Clev'd, O.

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Best Bolt Header in the world for $50. Address C. H. Baush & Sons, Holyoke, Mass.

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Screw-cutting Lathes. New Haven Co 's make, 17" x20' swing, $155. Box 229, AMERICAN MACHINIST.

Light and fine machinery to order; Foot Lathe Catalogue for stamp. E. O. Chase, Newark, N. J.

Design & superintendence of mach'y. Drawings, etc., made. Claud Mantle, 598 E. 134th St., N. Y.

For Sale—Second-hand drill presses, engine lathes and planers. Dietz, Gang & Co., Cincinnati, O.

Plans of mills and machinery furnished by practical draftsman. Box 98, AM. MACHINIST.

For Sale—Planers, Lathes, Milling Machines, Gear Cutter, etc., practically new. Send for list. J H. Parker, 46 So. Charles St., Balto., Md.

Wanted—Hardware specialties to build. Send 25 cents for "Eureka Knife and Shears Sharpener." W. A. Smith & Co., 227 Eddy Street, Providence, R. I.

Bound volumes for 1891. We are now prepared to take orders. Price, $4.00 per volume; express charges payable by purchaser. Address AMERICAN MACHINIST, 203 Broadway, New York.

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Special, experimental or other light machinery manufactured. Best equipped shop in the West for fine work. Manufacture one of the best hollow spindle bench lathes for the tool room or for manufacturing. Write us. Moseley & Co., Elgin, Ill.

For Sale—Stock in large iron manufacturing business, together with official position at fair salary, in a town of 40,000 inhabitants; good reasons for selling. Will take cash or good property. Address Box 84, AMERICAN MACHINIST.

$75.00 FOR ONE NEWSPAPER ARTICLE.—*The Tradesman*, of Chattanooga, Tenn., offers $75 in gold for the best single article on what line of industry would pay best in the South. For particulars address *The Tradesman*, Chattanooga, Tenn.

Wanted—One engine lathe—new or second-hand in good order—100" or 120" swing, to take 15' between centers; give full description of machine, with weight and photograph. Address B. W. P. P. O. Box 2227, New York City.

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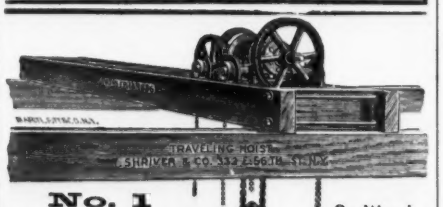

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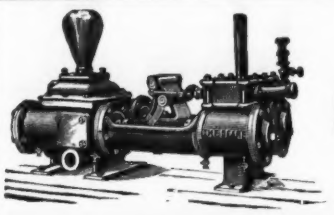

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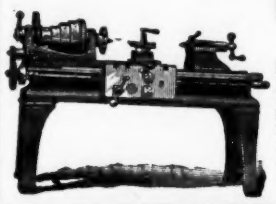

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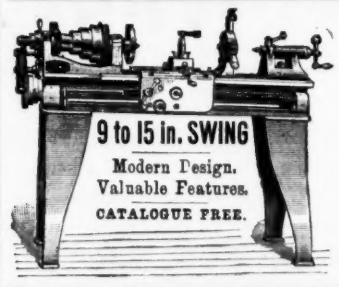

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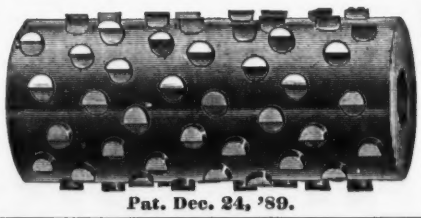

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13	2 1-4	1.35
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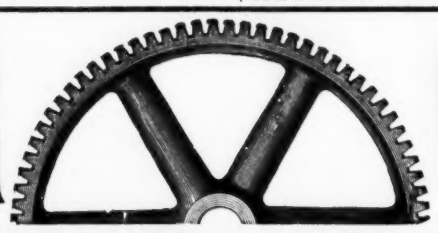
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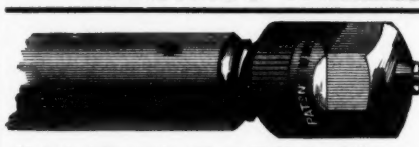

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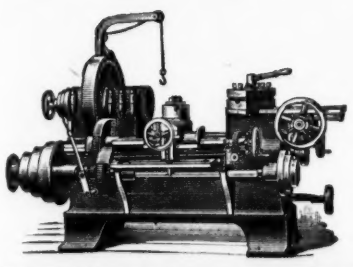

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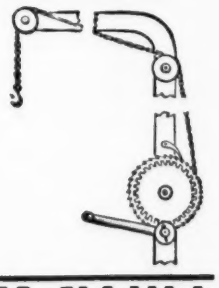

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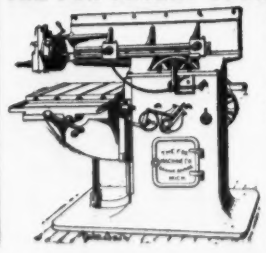

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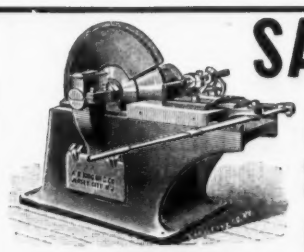

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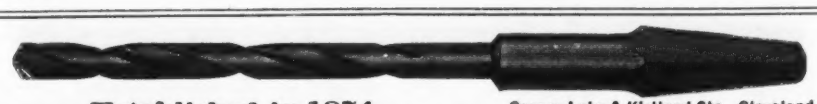

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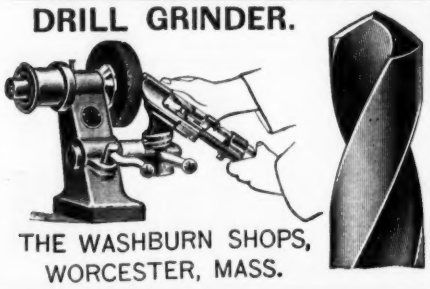

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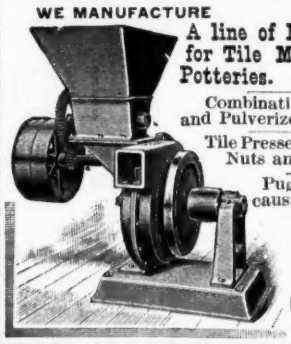

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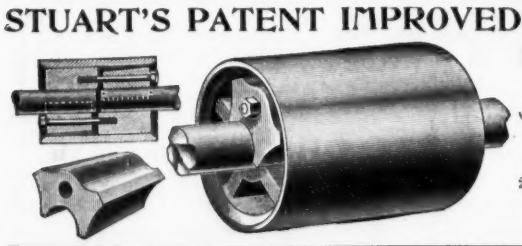

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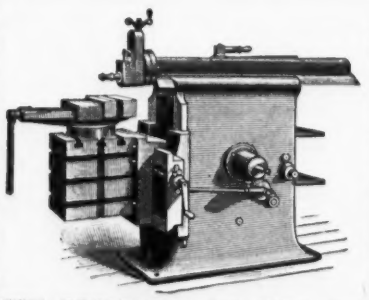

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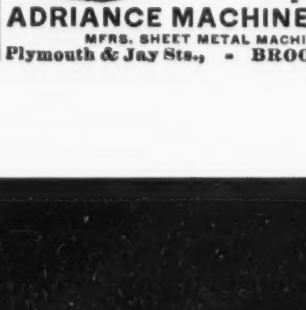

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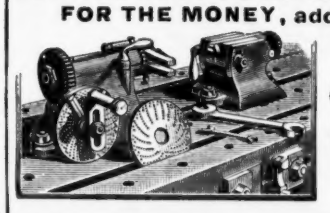

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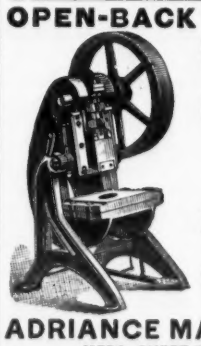

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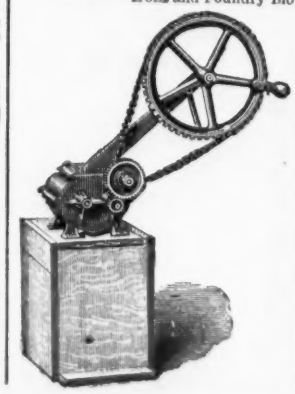

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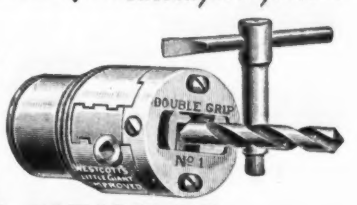

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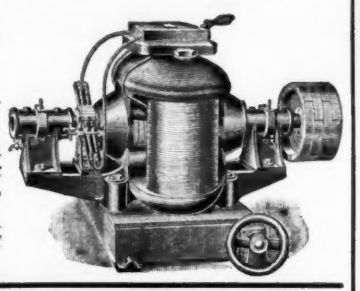

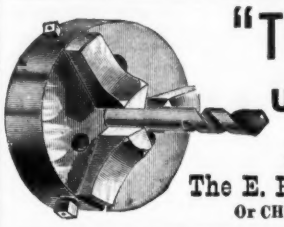

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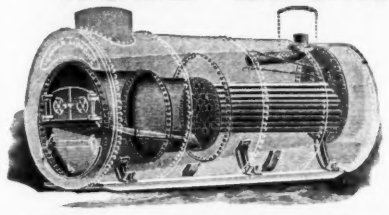

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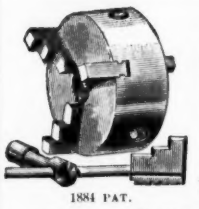
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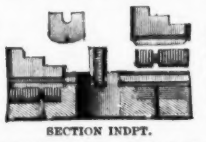
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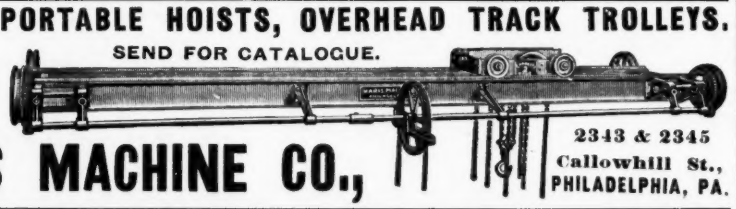

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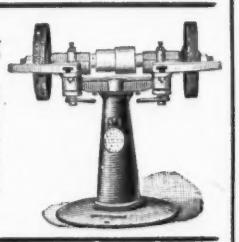

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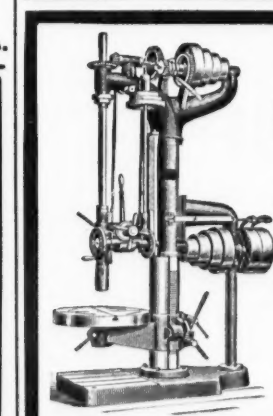

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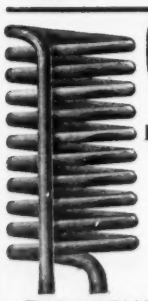

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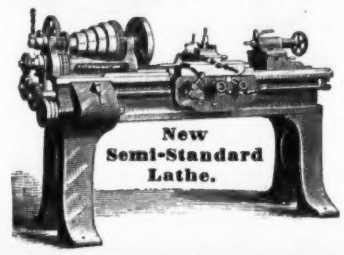

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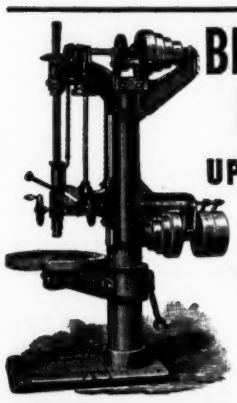

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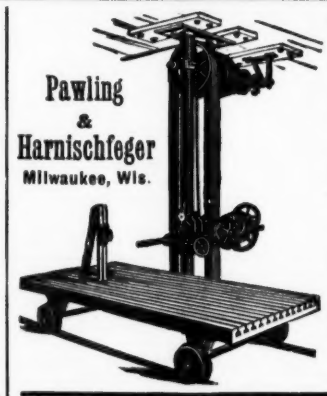

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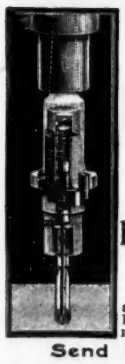

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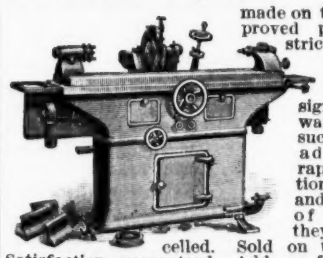

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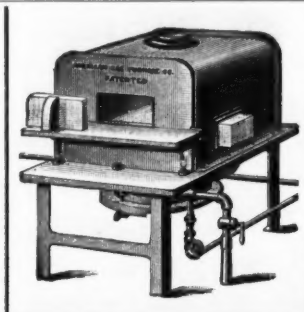

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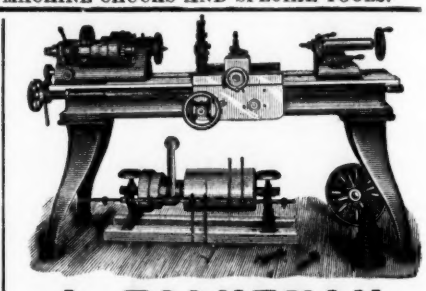

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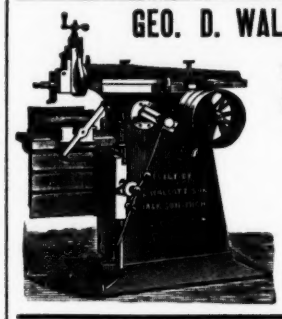

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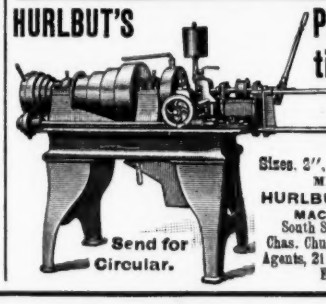

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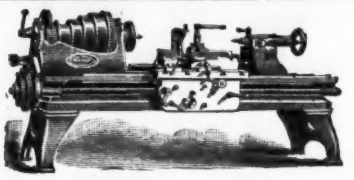

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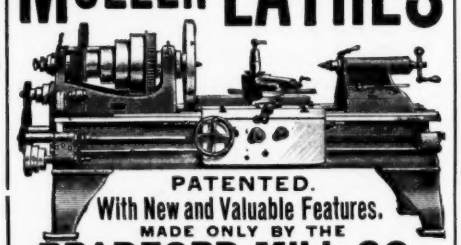

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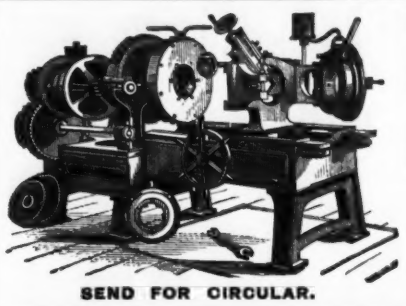

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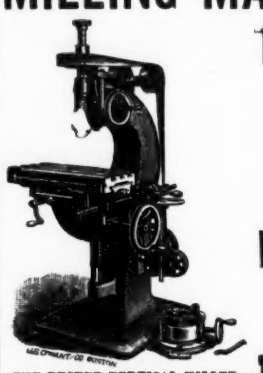

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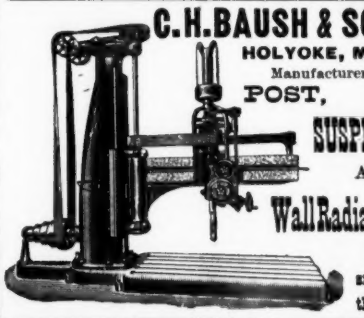

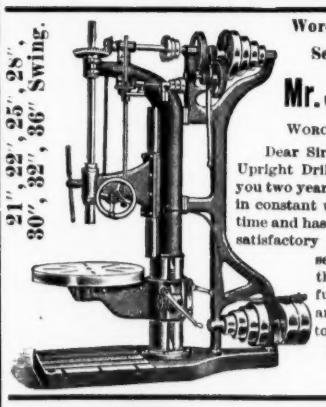

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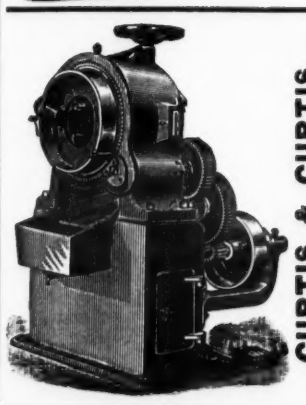

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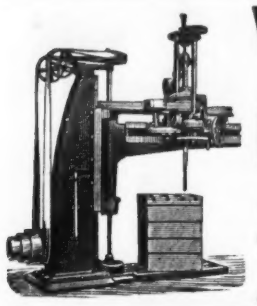

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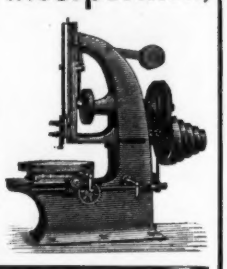

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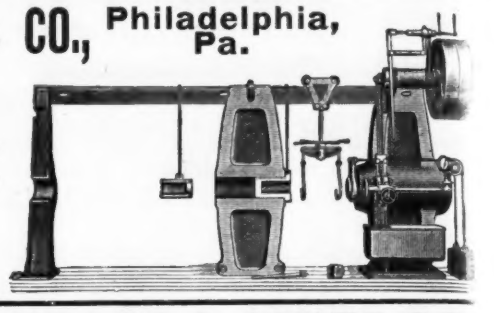

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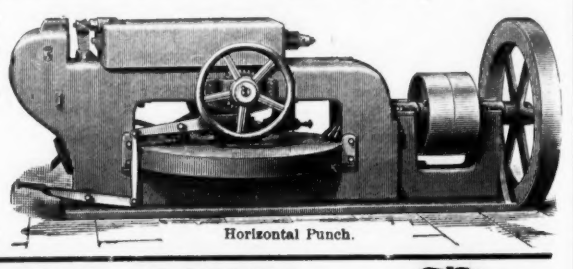
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Yours very truly
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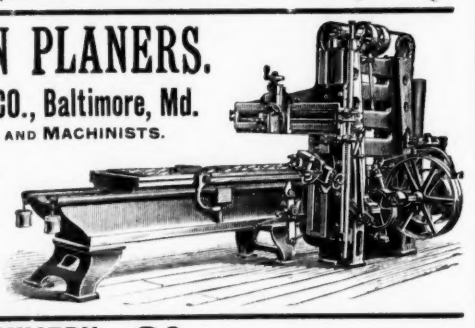

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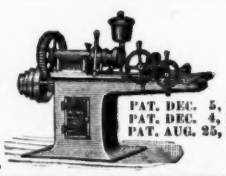

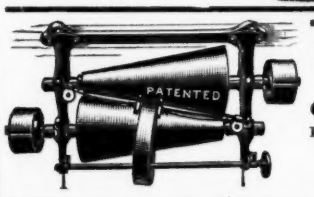

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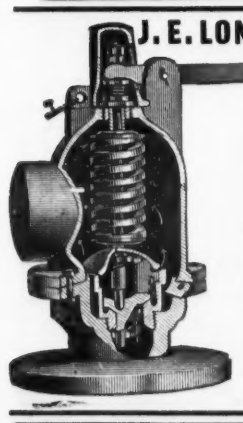

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Very respectfully, (Signed)
THE STRAIGHT LINE ENGINE CO., JOHN E. SWEET, Prest.

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WITH GROUND AND GRADUATED VIAL.
4-6 & 8 inch.

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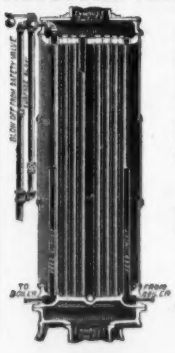

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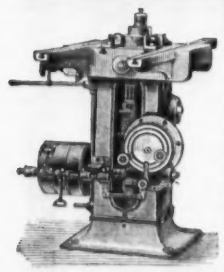

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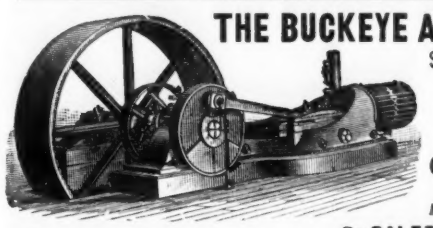

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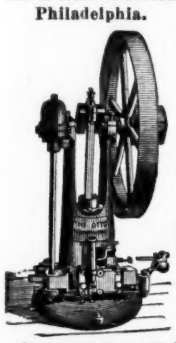

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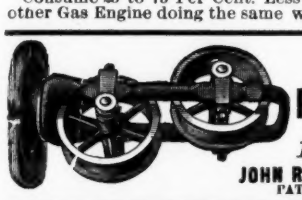

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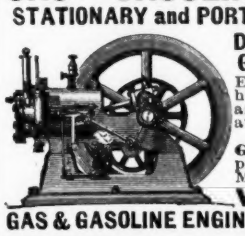

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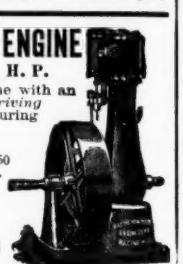

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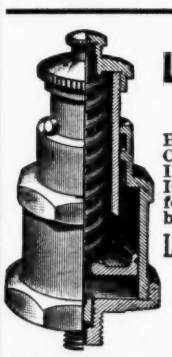

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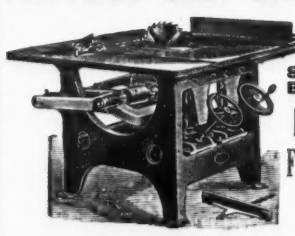

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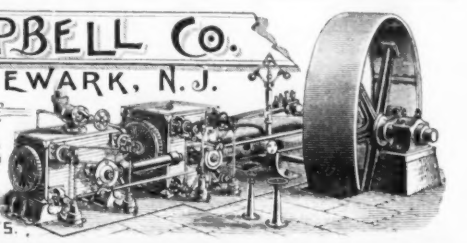

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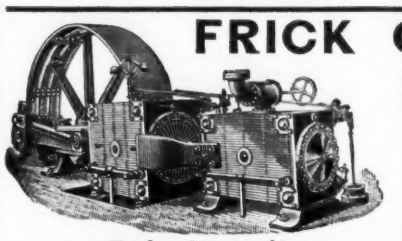

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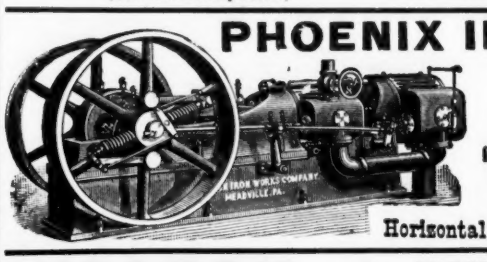

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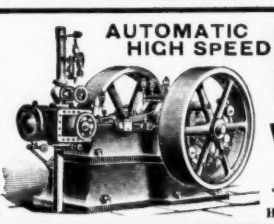

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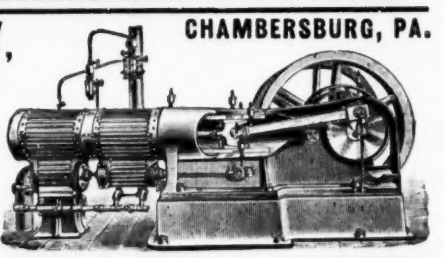

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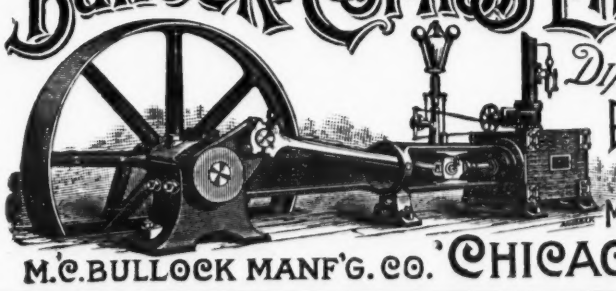

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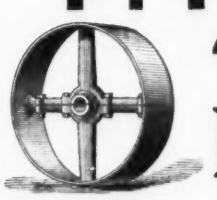

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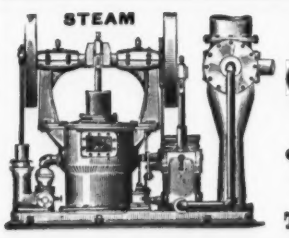

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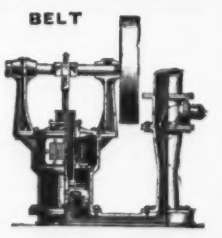

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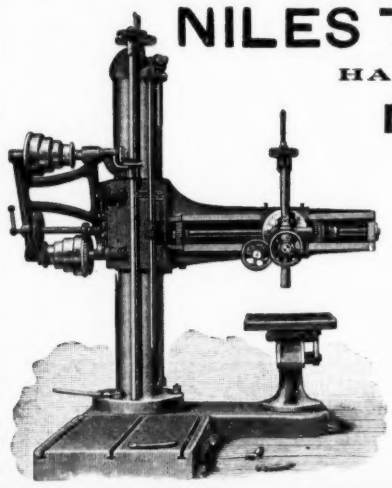

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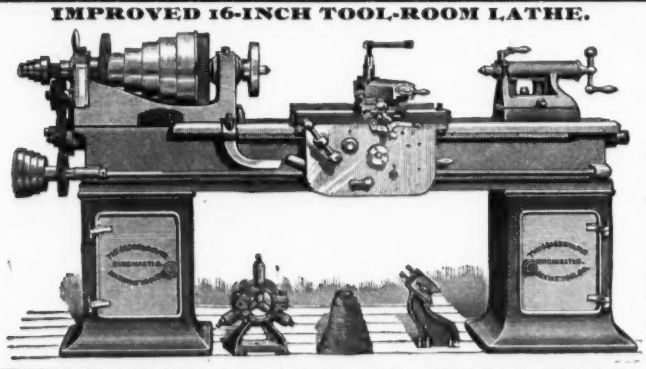

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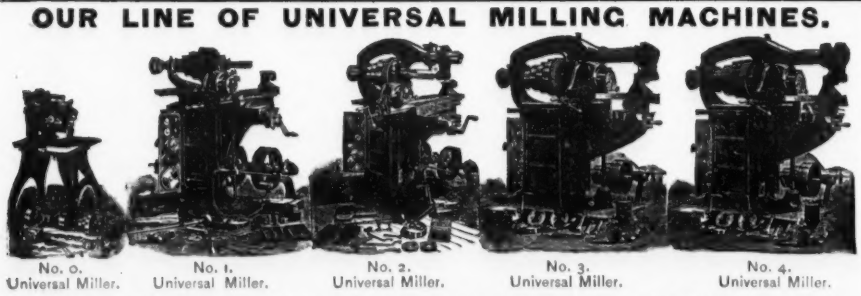

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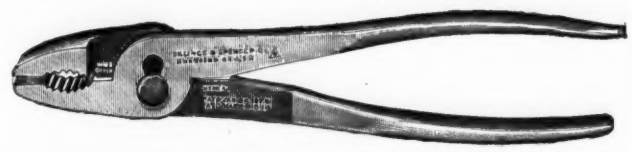

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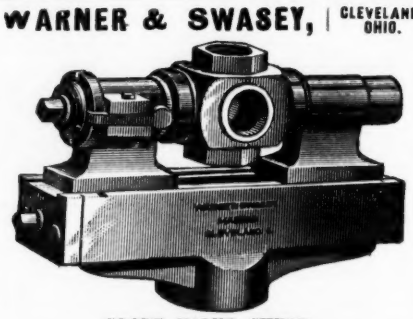

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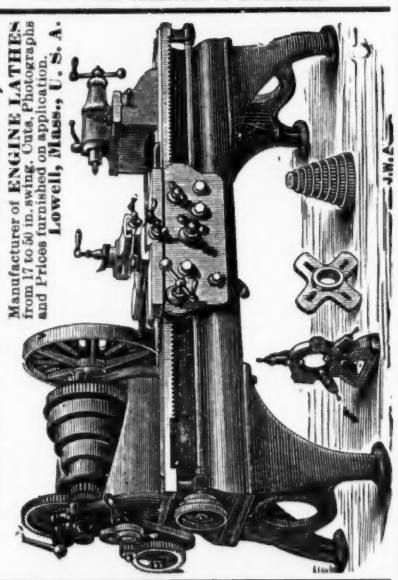

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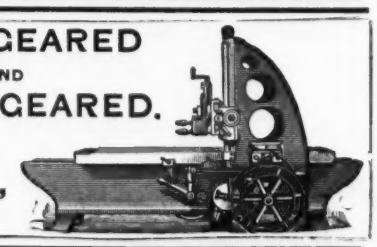

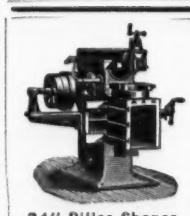

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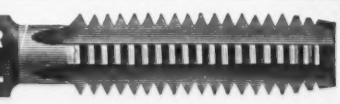

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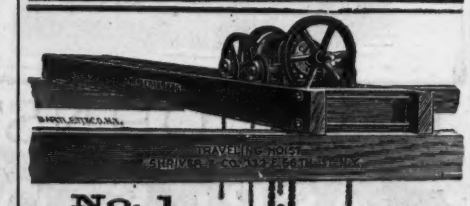

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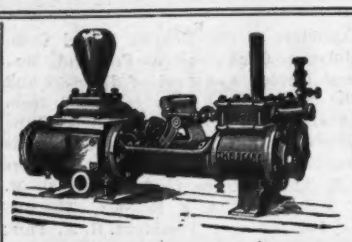

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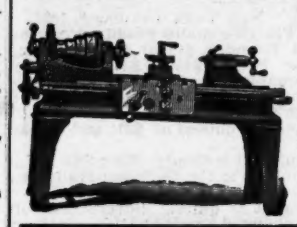

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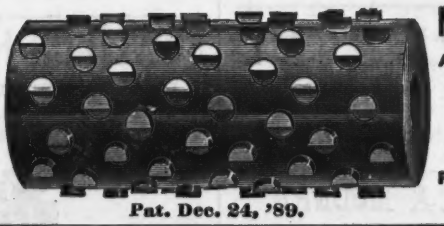

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